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It is with deep regret that we announce the resignation of Mr. T. C. Martin as co-editor of the *Electrical World*, in order to assume the position of General Secretary of the National Electric Light Association. While this step will not entail a complete severance of editorial relations, the departure of Mr. Martin will be keenly felt by his associates and, we believe, also by the electrical public which he has so ably and so loyally served in a journalistic capacity for more than a quarter of a century. One of the founders of the National Electric Light Association, Mr. Martin has continuously been closely associated with the activities of that body, which some years ago in recognition of valuable service transferred him to the dignity of honorary membership; and as electrical special agent of the United States Census Bureau for the past nine years, he came into still closer contact with the central-station industry represented by the association. Consequently, when the recent great growth of the body brought sharply forward the necessity of a permanent executive officer, the selection was obvious, and acceptance was urged as a duty. While the answer to the call has entailed a loss to this journal, it feels in compensation that Mr. Martin in his new field of effort will continue a powerful factor in the advancement of the electrical industry, and particularly of the active branch on which he will now concentrate his great ability and rare executive talent. The field of work is vast, and with proper cultivation the results possible are beyond present measure; and we can divulge that a strong hesitation on the part of Mr. Martin to leave the journalistic field was only overcome through conviction as to the great future before the National Electric Light Association, and a desire, bred by his long connection with it, to contribute toward advancing our national central-station organization to a leadership among the great industrial organizations of the world.

THE PLANT OF THE GREAT WESTERN POWER COMPANY.

It is altogether an off year when the coast does not furnish something instructive in the way of advances in hydro-electric work. The coast got into the game at the very start and has stayed right with it. An article elsewhere gives some interesting details of the electrical part of the equipment in addition to the account of the hydraulic works published some weeks since. The latter in themselves involved some innovations which would cause comment anywhere. Not only were the penstocks the largest ever built for similar head, but the turbines themselves were of record size, 18,000 hp, and are being used on what is certainly a record head for turbines of any size—525 ft. Reaction turbines such as these have commonly been used for moderate head only, but the requisition of great capacity at an economical speed for the generators made

turbines in this case far more desirable than the ordinary impulse wheels commonly used for these high heads. When it came to the generation of 10,000-kw output at 400 r.p.m., records were again attacked, this time in efficiency of high-voltage machines. Of course, winding machines so large as these for 11,000 volts is much less likely to cause loss of efficiency than in smaller units, all the windings being on a large scale; yet to pass 97 per cent at full load is a very notable feat. An interesting subsidiary feature is a hydraulic brake bearing on a ring at the base of the rotor by which the machine can be held in case of a leak through the wheel, or be checked quickly in an emergency.

The transformers are likewise of record size, being three-phase units of 10,000-kw output with an adroit combination of natural and water cooling. The normal voltage is 100,000 on the high-tension side, although taps are provided for 60,000 volts, at which the plant starts off. The full-load efficiency is 98.5 per cent, which leaves little to be desired. When one realizes that the combined generator and transformer efficiency in this plant rises to the full-load value of at least 95.5 per cent, it is sufficiently obvious that there is small improvement possible within the generating system. It is worth noting, too, that the generator efficiency is rising even at full load, so that the overload efficiency should be still very good. The line construction is interesting from the long spans used. The towers are about 71 ft. high, an unusually large figure, and are spaced at about 750 ft., while the line includes two spans of 3000 ft. on special towers. The obvious advantage of fewer points of support is an encouragement in the use of long spans, and we are glad to see the principle thus carried forward, although it would be interesting to know whether the present case is not quite near the limit of economical construction. With higher towers carrying relatively large wires, the general construction has to be very considerably strengthened, so that a point must be reached where one would find that cost could be lowered by using more and slenderer towers. This much is clear, that in work at very high tensions the tower line, or at least a line with long spans carried by the suspension type of insulator, is of the utmost value. The line here considered is an admirable specimen of the application of modern methods, and it is pleasant to recognize in the general manager of the system the pioneer in three-phase transmission on this side of the Atlantic.

The High Line in Voltage.

We give elsewhere in these columns some further details of the Grand Rapids-Muskegon plant, the first in the world to pass the 100,000-volt limit. It has been, upon the whole, singularly successful in securing effective and continuous service, and it is not too much to say that, upon the whole, it has done better than most plants at half the voltage. There is perhaps no especial secret in its success save very good construction and constant care, yet there are two elements which are worth comment in this connection. In the first place, it is equipped with suspension insulators, which are unquestionably better adapted for extreme voltage than any pin type of insulator yet devised, since by adding disks in tandem one can get any reasonable factor of safety without serious mechanical complication. So long as one adheres to pin construction, he deals with an arrangement that is essentially mechanical, the parts being badly arranged for the strains which must be borne. Second, the plant as a whole is free from unnecessary switching complications. The whole of each line is in permanent connection clear back to the generator leads. Even the switches in these are plugged shut. The load-limiting devices are in the distributing system, and short-circuits can do little harm by reason of the waterwheels giving up under any dangerous overload. Possibly this simplicity may be excessive, but it is a relief to see it after looking over systems in which one set of safeguards is set to watch over another until their aggregate is something terrible to pay for, and no joke to keep in order. Why should not a generator and its transformer be taken as a unit when the dimensions of the system permit? Surely this plant, enormous as is the voltage, has made good in a fashion that needs no apology, and at a cost far less than that of some much be-switched contemporaries.

New England and Pennsylvania Electric Light Conventions.

Elsewhere are given reports of the meetings last week of two of the youngest electric light associations, both of which, in attendance and discussion of papers, commence their convention careers in a manner that augurs well for the future. Indeed, some of the older bodies would find it difficult to select a record from their past which would equal that made at Portsmouth or Eagles Mere. At both of the conventions the leading topics were exhaust steam heating and, naturally, the tungsten lamp. It seems remarkable that there are only three exhaust steam heating plants in New England, while Pennsylvania counts 69. The advantages of the tungsten lamp to the central station in meeting gas competition and in popularizing the use of electricity, are evidently being appreciated increasingly by the central stations of the country. The difficulties of manufacturing a robust 110-volt tungsten lamp has evidently caused one company at least to take the bull by the horns and go back to the low-voltage lighting system which was in vogue many years ago. On alternating-current distribution circuits this is an easy matter, since it requires only the installation of a transformer giving a secondary e.m.f. of 50 or more volts instead of 110 volts as at present. Coupled with the longer life of low-voltage tungsten lamps the advantage is claimed that the ordinary 16-cp carbon-filament lamp can be displaced by a 50-volt or 60-volt tungsten lamp without necessitating any change in the present standard fittings or number of outlets. By a mere substitution of lamps in the same sockets and a reduction in voltage, the same distribution and illumination are retained while the cost of the illumination is reduced and the life of the lamps increased.

Enthusiasm over the work of the national association and its Pennsylvania branch was the keynote of the convention at Eagles Mere, where the attendance reached the 200 mark. Each of the papers presented partook of the nature of a report submitted by a committee, there having been assigned for its preparation an editor, with usually two or more assistant editors. Thus, the thoughts expressed represented a consensus of opinion of several rather than that of one man. Although this plan tends to eliminate personal opinion, yet it seems to invite rather than discourage discussion of the paper after presentation. This result is attributable to the fact that the participants doubtless held that they were discussing in an

impersonal manner the statements made in the paper and would not be considered as criticizing the author. While none of the papers could be characterized as dealing exclusively with local topics, yet there was in evidence a desire to limit the discussion to points of local interest and leave to the national association the discussion of topics of the more general features of the electric lighting business.

A New Type of Constant-Current Machine.

The constant-current dynamo was well known and much used in the earlier days of series arc lighting, although in recent years it has fallen into disuse, owing to the development of the constant-current or "tub" transformer. There were various types of constant-current dynamo, but a common expedient for maintaining constancy of current under varying load was to rotate the brushes around the commutator, by an automatic apparatus controlled by a current-measuring device. A new type of constant-current machine has been recently described in a paper by Herr Von Ch. Kraemer, before the Cologne convention of the Verband Deutscher Elektrotechniker, which is abstracted in the Digest. It consists essentially of a double compound machine in which there are three m.m.fs. acting, viz., a shunt m.m.f., a series m.m.f. and a separate m.m.f. The two latter are mutually opposed and cancel at normal operation, leaving the machine entirely shunt-working under such conditions. If the external resistance in the circuit of the machine is diminished, the series winding tends to overpower the separate winding, and opposes the shunt winding, thus lowering the generated voltage; whereas, if the external resistance increases, the series winding tends to weaken and the separate excitation tends to aid the shunt winding—the result being that the generated voltage rises until normal current strength is restored, provided that the working range of the machine is not exceeded.

A number of applications are given for this triple m.m.f. type of machine, of which the supply of current to a searchlight may be taken as an example. The usual method of operating a searchlight on board ship is to take current from the lighting mains through a ballast resistance. This is an objectionable method when powerful searchlights have to be used, because the large current required calls for a cumbersome and wasteful resistance. By inserting a local motor-dynamo, the dynamo being of the new constant-current type, the installation is made more compact and less wasteful of power. The dynamo may be short-circuited without giving rise to excessive current, and the current will be automatically maintained constant for all working conditions of arc length, from actual contact of the carbons to widest normal separation. The applications described as already existing for this machine relate at least as much to motor as to generator service.

Vibration Galvanometers.

During the last few years a new species of galvanometer has come into existence called the vibration galvanometer. This instrument is restricted to alternating-current measurements. It hardly gives any deflection with a direct current. Moreover, it will not respond effectually to any and every alternating current. The movable system has a certain free mechanical vibration-frequency. Within certain limits, this mechanical vibration-frequency is capable of adjustment. When the instrument is connected to an alternating-current circuit, so as to receive a feeble alternating current, there is very little response, unless the mechanical vibration-frequency of the movable system agrees with the alternating-current frequency, and then the deflection becomes very large. The alternating electromagnetic forces acting on the movable system set up mechanical resonance and build up a large swing. A form of vibration galvanometer that has become fairly well known consists essentially of a thin steel wire, placed so as to be free to vibrate in an alternating magnetic field produced by the current to be measured. The amplitude of the vibration is observed optically. Care has to be taken to tune the wire to the frequency of the circuit, and when this adjustment is correct, the deflection is very much greater than when the wire's mechanical frequency disagrees with the current frequency.

The advantage of a vibration galvanometer is that, when the alternating-current frequency is constant, a large deflection is obtainable, or the sensitiveness of the instrument is high. A peculiar fact about the behavior of the instrument is that it does not respond to harmonics in the current; but only to the fundamental sinusoid in the current. This property is sometimes an advantage, and sometimes a disadvantage. Even when it is a disadvantage, the advantage of sensitiveness in the instrument usually preponderates, because it is very difficult to make a galvanometer for alternating currents that shall have anything like the sensibility of the ordinary direct-current galvanometer. Another peculiarity of a vibration galvanometer is that it is a veritable alternating-current motor, and develops a very appreciable counter e.m.f. In fact, its sensibility depends upon the magnitude of this e.m.f., because the power absorbed in the movable system is the cophase product of the current and this e.m.f., and the smaller the damping force, the larger must be the vibration amplitude in order to dissipate this power.

In a paper recently read before the Physical Society of London, Mr. W. Duddell describes a new form of vibration galvanometer which possesses particular advantages. It consists essentially of a Duddell bifilar oscillograph, except that the suspension, instead of being damped by oil to an aperiodic condition, is left free to vibrate, in air, with as little damping as possible. The range of frequency adjustment is unusually large—from 90 to 1900 cycles per second—which is obtained both by altering the length of the wires and by varying their tension. The sensibility claimed for this new form of vibration galvanometer, within the range of its frequency, is very high. It is said that a few thousandths of a micro-ampere can be detected. The instrument promises to be of great service to the telephonist. At the same time, the resonance is so sharp that a very small change in frequency may affect the deflection of the spot of light materially. Thus, at a frequency of 595 cycles, a certain strength of current gave a deflection of 290 mm at 1 m scale-distance. At this frequency the tuning was correct. At 580 cycles, and again at 600 cycles, the deflection with the same current fell off to 50 mm. That is, a change of about 2 per cent in the frequency reduced the deflection to one-sixth of its former value. This means that great care will be needed to keep the frequency constant, and the instrument sharply tuned, when accurate measurements are made. Nevertheless, there can be little doubt that Mr. Duddell has introduced a distinct improvement into galvanometers of the vibration type.

New York Edison Entertains Philadelphia Electric.

On Saturday, Sept. 11, the Association of Employees of the New York Edison Company entertained the athletic association and guests of the Philadelphia Electric Company, the ocasion being the annual baseball game between the teams of both companies. The official guests, officers and committees of the New York Edison Company embarked from Pier 1, North River, on the steamboat *Majestic*, proceeding thence to the Adams Express dock adjacent to the Pennsylvania Railroad terminal in Jersey City, to meet the special 12-car train bearing the Philadelphia contingent. The latter numbered about 600 and included the company's officers and the entire Board of Fire Underwriters from the Quaker City.

When all were on board, the *Majestic* steamed down the river to the bay, passing the Statue of Liberty, around Governor's Island, proceeding up the East River along the Brooklyn shore as far as Man-of-War Rock, south of Blackwell's Island. Luncheon was served on the trip up the river, and after an exchange of salutes at the Waterside station, the boat headed down stream again along the New York shore, rounding the Battery and continuing up the North (Hudson) River, passing the Soldiers' and Sailors' Monument, Grant's Tomb and the Shadyside property of the New York Edison Company, landing at 158th Street. Here 40 automobiles met the party and conveyed it to the American League Baseball Park, 165th Street and Broadway, where, amid the usual din, waving of flags, etc., the Philadelphia and New York teams met on the gridiron before an audience of approximately 10,000 people.

The exciting game which followed was started by Miss A. Murray, daughter of the general manager of the New York Edison Company. The score remained 1 to 0 in favor of the New York team until the sixth inning, when four more runs were made and from that on to the end of the ninth inning no changes were made in the score, which at the end of the game was 5 to 0 in favor of the Edison team. After the game, the automobiles were again pressed into service, the party being driven to Pabst's Harlem Casino, on 125th Street, where covers were spread for 1200. At the conclusion of the dinner, short speeches of a felicitous nature were made by Mr. T. E. Murray, general manager and vice-president of the New York Edison Company, and Mr. J. B. McCall, president of the Philadelphia Electric Company. The Philadelphia guests were then escorted in automobiles down Seventh Avenue and the "Great White Way" to the Twenty-third Street Ferry and put aboard their special train for Philadelphia again. The general opinion expressed was that few ever crowded such a variety of amusement into nine hours and a half.

Consolidation of Central-Station Companies in Michigan.

At the meeting of the Electric Club, of Chicago, on Sept. 8, Mr. H. F. Holland, chairman of the membership committee, presented a report in which he said that the club has a membership of 250 and that a determined effort is to be made to secure a membership of 1000. The club was organized early last year, and is incorporated under the laws of Illinois. Its membership embraces many electrical men of prominence. Meetings are held every Wednesday after a mid-day luncheon, and at these some speaker is provided who addresses the club on a topic of current interest, the principal address being followed by a discussion. The annual dues are $5 a year, and the initiation fee is $5. At some future time the club hopes to secure permanent quarters, although this project will probably be held in abeyance until the membership is largely increased. In the meantime the weekly luncheons are held in the grill-room of the Chicago Automobile Club, which serves a table d'hote luncheon.

On the invitation of President Howlett, Mr. W. H. Zimmerman, late manager of the Michigan Power Company, of Lansing, Mich., addressed the club briefly on the subject of the marked tendency toward the consolidation of small electric power companies in the State of Michigan. He said that 18 power companies were recently incorporated in one day in that State. This movement has been characterized by great activity, and is watched closely by the people of Michigan. Many people of prominence are interested in it. There has been some suspicion on the part of the public that these combinations would result in an increase in the price of electricity, but there is really nothing to fear in the matter of excessive rates; indeed, the tendency is distinctly in the other direction, it being the undoubted policy of the new companies to make lower rates as the result of the economies effected by consolidation. Apparently the public is now satisfied that these combinations are not detrimental, and everything indicates that the outcome of the movement will be of great benefit to the communities affected. In Lansing a large number of small manufacturers have been attracted by the low rates for electrical energy. It would seem that this tendency toward the consolidation of electric power companies is one form of combination which is of general benefit.

Chicago Street-Railway Labor Situation.

While it appeared several weeks ago that the dispute between the street-railway companies of Chicago and their employees in relation to wages was settled to the satisfaction of both sides, the proposed settlement was not accepted by the men when they voted on it, although their representatives had expressed themselves as satisfied with it. Negotiations have been continued since that time, but so far with no definite result. The situation is complicated by the fact that there are two large companies in the city, and their policies in dealing with the men are not identical. The men say that the companies may be consolidated later and that it will be wise for them to make a uniform settlement throughout the city. Mr. Walter L. Fisher, a lawyer acting for the city in the effort to effect a compromise, makes this statement: "I am afraid that we have exhausted the possibilities of negotiation. When one of the companies refuses to join in a proposition because the wages are too high, and the men employed on the other line reject the same proposition because the wages are too low, there seems to be nothing to do but leave the entire matter to a board of arbitration whose decision shall be binding on both parties." If the dispute cannot be settled by arbitration, there is still a prospect that there may be an extensive street-railway strike in Chicago.

New Colorado Hydro-Electric Project.

Col. C. E. Apponi, of El Paso, a well-known consulting engineer, is promoting the project of establishing a great hydro-electric plant on the Colorado River at what is known as The Needles, situated about 25 miles south of Powell, Ariz. Colonel Apponi secured the water rights to a strip of the river territory five miles in length at the first rapids, and it is at that place the plant will be located. A complete survey of the location has been made, and a syndicate of Milwaukee has been interested. The initial plant will have a capacity of 30,000 hp, which can be increased from time to time as the demand for power may require. It is planned to build a number of transmission lines and to supply towns and industrial plants within a radius of 170 miles of the generating plant. There are many mines within the proposed radius that will also be given the opportunity of using the cheap power. In order to utilize the flow of the river, a large dam will be constructed. In connection with the hydro-electric project the water from the storage reservoir will be conducted by means of a system of canals over a large scope of land, which will be made productive by means of irrigation. The plans call for the expenditure of more than $2,000,000.

Mexican Hydro-Electric Projects.

The great benefit accomplished through the introduction of electric power in mining operations in the districts of Guanajuato, El Oro and Pachuca have given a great impetus to the installation of electric power plants in different mining sections of Mexico. The largest of these proposed hydro-electric plants is that which a Canadian syndicate, headed by Dr. F. S. Pearson, is preparing to erect on the Conchos River, near Santa Rosalia, State of Chihuahua, and which will generate power for transmission to the mining districts of Santa Eulalia and Parral. Many smaller hydro-electric projects are on foot. Most of them have in view the furnishing of electric power for mines and reduction mills. The Mines of Mexico Company, of Denver, Col., which obtained a concession from the Mexican Government several months ago for the installation of a large hydro-electric plant on the Mayo River, in the State of Sonora, has had the surveys made for the proposed plant and necessary dams and the active work of construction will soon be started. The sites for three dams were located. The hydro-electric plant will be located near Alamos. This place is in the center of a rich mining territory. It is planned to build several transmission lines for the purpose of furnishing power for mining districts situated within a radius of 175 miles. The company has extensive mining interests of its own in that section which will be greatly benefited by the securing of this cheap power.

Mr. L. E. Curtis, of Colorado Springs, Col., vice-president, treasurer and general manager of the Guanajuato Power & Electric Company, the Michoacan Power Company and allied interests, is of the opinion that the field for the use of electric power in Mexico is very broad outside of the mining industry. This American concern is the pioneer electric power enterprise in Mexico. It has its main hydro-electric plant at El Duro, State of Michoacan, and has transmission lines running into the Guanajuato, Irapuato and other mining and industrial districts. In discussing the affairs of his companies, Mr. Curtis said:

"We are increasing the capacity of our plants by inaugurating the work of constructing a new plant which, when completed, will bring the company's total capacity up to 21,000 hp. I find conditions auguring well for the future. The mining companies are now using electric power to the exclusion of all other methods for driving their machinery. They find it cheaper and far more convenient than any other power. But our operations have been increased very greatly by the more universal use of electricity in driving the wheels of industrial concerns in localities where mining is not carried on. The farming region in the States of Guanajuato and Michoacan are taking to electric power rapidly, and the factories in the territory reached by our transmission lines are adopting the power with hardly an exception. Thousands of wells for irrigation situated in the vicinity of Celaya, Irapuato, Ocotlan, La Barca, Silao, Leon and other places are being pumped by electricity instead of the ancient, primitive methods which were formerly in use. Factories in these districts are making heavy demands upon our plants, and it is for the purpose of meeting these demands that we have just begun the construction of our third hydro-electric plant, which is to have a capacity of 10,000 hp."

Jose Enriquez Guzman will soon begin the erection of a hydro-electric plant on the Altar River, near Altar, State of Sonora. He will build a dam across the river to form a water reservoir for generating electrical energy, as well as to afford an abundant supply for irrigating a large tract of valley land. The electric power will be transmitted to towns and industrial plants in that region.

Public announcement is made by the Chapala Hydro-Electric & Irrigation Company that it has obtained a loan of $2,200,000 from the Caja de Prestamos of Mexico City. This money will be used to erect a new hydro-electric plant at Puente Grande, on the Santiago River, near Guadalajara, and in the construction of transmission lines to the mining districts of Etzatlan and Hostotipaquillo. The company has also obtained a loan of $3,000,000 from the Federal Government, through the Department of Fomento. The latter sum will be used to build a dike across a portion of Lake Chapala and in the construction of an extensive system of irrigation canals and ditches. The company has headquarters at Guadalajara. E. Pinson is general manager.

Adolfo Fartinez has obtained a concession from the Federal Government for the installation of a hydro-electric plant on the Quetzalpa River, State of Hidalgo. He has had surveys made for the proposed plant, and it is claimed that 10,000 hp can be generated. Transmission lines will be built to industrial centers in that section. Mr. Fartinez is said to be representing large financial interests in the proposed enterprise. He lives at Pachuca, State of Hidalgo.

Jose Riaz Rubin, who recently obtained a concession from the Federal Government for the utilization of the water in the Matamoros River for generating electric power, is preparing to build a dam across the stream and install a hydro-electric plant. He will furnish power to neighboring towns and industrial plants in that section. He lives at Puebla.

The Guanajuato Reduction & Mines Company has begun the construction of an electric railway which will run from its Las Playas mines to the yards at Tepetaya. The road will do a freight business exclusively, and will be one of a number of electric mining roads in the Guanajuato district.

Winnipeg (Manitoba) Electric Lighting Controversy.

There is a legal battle pending in Winnipeg, Manitoba, between the city and the Winnipeg Electric Company, the result of which will have an important bearing on electrical interests all over Canada. It has been made public that there are some 600 householders who have made application for electric service who are not able to obtain it, as the city does not wish to prejudice its case by issuing permits for the erection of electric light poles.

In 1904 a Winnipeg livery stable sued the city for $16.50 damages resulting to a carriage which fell into a street excavation which the company claimed was not properly protected. This excavation was made by the street railway company under the authority of a permit issued to the Manitoba Gas & Electric Light Company, whose interests and charter rights were acquired by the Winnipeg Electric Street Railway Company, now absorbed by the Winnipeg Electric Company. The city endeavored to make the company a third party to the suit, but the application was opposed on the ground that there was no such corporation as the "Manitoba Gas & Electric Light Company." This is the only company that ever made a contract with the city for the supply of electric light and gas. The city was, therefore, in the position of not knowing whom it was dealing with. Later, the city solicitor notified the company that it could not bring in power from outside the city's limits without first obtaining the authority of the city. The company, however, brought in the power and sold it, and in the fall of 1906, Nov. 12, the city filed a claim asking the courts to declare that they had no right to do so, and no right to erect poles on the streets, etc. Since then there have been various stages of legal proceedings, and, in the meantime, the city had stopped the issuing of permits. In response, however, to the importunity of citizens to get electric light a clause was drafted and added to the permits. This "without prejudice" clause inserted by the city on the permits was objectionable to the company and they returned the permits.

During the past week both parties to the litigation have isssued ultimatums. The Winnipeg Electric Company has notified the city that it will erect poles where it wants without any permit from the city. On the other hand, the city has notified the company that it will be given until Sept. 20, 1909, to furnish these 600 householders with light and take out pole permits as provided by the city bearing the "without prejudice" clause. In the meantime the company is erecting poles on any of the city streets where a new pole line is required and so far the city has taken no action.

Fremont (Ohio) Hydro-Electric Plant.

Work on the new power plant of the Fremont Power & Light Company, of Fremont, Ohio, will soon begin, the contract having been awarded. The plant will be located at Ballville, one mile south of Fremont, and water-power will be obtained from a fall of the Fremont River at that point. The plant will have a capacity of 2500 hp, with a reserve steam plant of 1000 hp, and the total cost will be about $600,000. The first work will be the erection of a reinforced concrete dam across the Sandusky River. It will be 260 ft. long, 27 ft. high and 36 ft. thick at the base. The power house will be erected down the river in the bottom land and the water will be conducted to it through a steel pipe 14 ft. in diameter and 3000 ft. long, with a fall of 42 ft. in that distance. The plant will take care of all the lighting and power business in and about Fremont and in addition it is said that power will be supplied to two or three electric railways.

The company was incorporated about four years ago, and has been financed by Cameron & Company, of Chicago. Robert B. Lyle, of Chicago, has been awarded the contract for construction, and Mr. Walter Putnam will be the superintendent in carrying out the work.

Hearing on Appeal Against Connecticut River Transmission Company's Franchise.

The Massachusetts Gas and Electric Light Commission gave a public hearing at the Worcester City Hall on Sept. 7 in connection with the franchise granted the Connecticut River Transmission Company by the Board of Aldermen in July last, an appeal having been taken to the commission by the Worcester Electric Light Company. By the terms of the franchise the transmission company is authorized to enter the city with its lines and to maintain a power supply in certain specified districts, the service of individual customers having a connected motor load of 15 hp and above being a prominent feature of the grant.

The case offers many similarities to the recently decided appeal of the Fitchburg Gas & Electric Light Company in connection with the transmission company. In the latter case the board ruled that the transmission company might enter the Fitchburg power market through the sale of energy to consumers having connected loads of 300 hp and over, suggesting an agreement by which the local central station should purchase power of the Connecticut River organization, leaving the latter free to engage in the logical business of delivering power in large blocks over wide areas without becoming enmeshed in the problems of local distribution. The Worcester company conducted its case on much the same grounds as the Fitchburg organization, and early in the hearing the transmission company expressed itself as willing to leave the small power business to the local system, along the lines suggested by the Fitchburg decision. The city authorities of Worcester, however, urged that the lowest feasible rates be given to all classes of consumers, and the hearing went forward on the basis of making clear the ability of the Worcester company to meet the demands of power consumers at reasonable rates and the special fitness of the transmission company to supply service in the larger power field which is, for the present at least, beyond the scope of the local central-station organization. The Worcester company's case was conducted by its counsel, Mr. Everett W. Burdett, of Boston; the transmission company's side was presented by Mr. Charles T. Tatman, of Worcester, and the city of Worcester was represented by Mayor James Logan and City Solicitor Ernest H. Vaughan.

Counsel Tatman opened the hearing by outlining the development of the transmission company, stating that it is now supplying power in Gardner and Fitchburg, and will shortly serve Leominster and Clinton from its new plant on the Connecticut at Vernon, Vt. A capacity of 12,500 kw is now installed, and in a short time, probably within four weeks, power can be delivered in Worcester. The ultimate capacity of the plant is 20,000 kw. The company plans to operate a 70,000-volt line to a substation in the northwest corner of Worcester over private right-of-way; then to step down to 13,000 volts for transmission through the city to the South Works of the American Steel & Wire Company. It is hoped to carry the line very largely on private property, and to enter into an agreement with the Worcester company for a rental use of its underground conduits in the business portions of the city. The Worcester company will not permit the use of its conduits unless a large minimum power unit is fixed in connection with local sales. The transmission company is willing to serve customers along its lines requiring any amount of power, large or small, as required by the city authorities, but will not consider it a hardship if the commission should place the limit as high as 300 hp, although it would prefer a lower limit.

Chairman Barker made public a letter from Chief Engineer F. H. Daniels, of the American Steel & Wire Company, which stated that the installation in Worcester of a 15-ton electric furnace was dependent upon the introduction of Connecticut River power. This furnace is to be used for high-grade steel. The furnace will cost about $60,000, and will be operated by electricity on a fuel-cost basis with Pittsburgh. Unless this cheap power can be secured the furnace will have to be located in Pittsburgh or Chicago, where energy can be generated cheaply from coal at $1 per ton or by gas generated from blast-furnace wastes. The company has contracted for 5000 hp from the transmission company and will produce a grade of steel never before attained in Worcester, and also give employment to about 300 additional men.

Counsel Burdett then introduced a new schedule of power rates effective Sept. 1 on the system of the Worcester Electric Light Company. He stated that these rates represent a considerable reduction from those previously in force, running from 6 cents to 2 cents per kw-hour instead of from 8 cents to 2 cents, and invited comparison with power rates in other similar territory. He said three companies in Massachusetts are furnishing power at less than 2 cents per kw-hour. The new Worcester schedule starts with a power rate of 6 cents per unit from 0 kw-hour to 150 kw-hours per month, falling off gradually to 2 cents for a consumption of 25,000 units per month and over. The rates are tabulated so that the maximum bill which each consumer in a class can pay is stated in the schedule, together with the connected load which he can operate on the maximum bill. Thus, a consumer using between 800 kw-hours and 1000 kw-hours per month secures his energy at 4.7 cents per unit, with a maximum possible bill for the upper limit of consumption of $45 and a 5.35-hp load. Mr. Burdett said that the Worcester company welcomes the entrance of hydro-electric power so long as it is confined to its proper field of serving large consumers. If the transmission company should be obliged to sell power to small consumers of 15 hp, as fixed in the franchise, the result would either be bankruptcy or higher rates to the large industries, assuming that all the business offered were taken up. An investment of certainly $1,000,000 would be necessary to establish a distribution system delivering hydro-electric power to small consumers independently of the Worcester company. The Worcester Electric Light Company had only recently equipped itself to meet the full anticipated development of its power system, but it is now in first-class condition to meet a greatly increased demand for power service.

Mayor James Logan, of Worcester, who is also general manager of the United States Envelope Company, submitted an exhaustive discussion of the cost of electric power in Massachusetts cities of about 100,000 population, and purporting to show that this class of business had been more extensively cultivated in other cities than in Worcester. The report was based on figures prepared for the city by Mr. William D. Marks, of New York, consulting engineer, and in a large measure reviewed Mr. Marks' data printed in the *Electrical World* of Sept. 2, 1909, page 555. Mr. Marks was present at the hearing, but was not called upon as a witness.

Mr. Henry I. Harriman, president of the Connecticut River Transmission Company, called for examination by counsel for the Worcester company, briefly reviewed the physical data of the system as presented in the Fitchburg case, and abstracted in these columns. Mr. Harriman stated that, in the main, small consumers require the supply of primary power, although in certain cases where the consumer has an economical steam plant of moderate size secondary power would be as acceptable as in the case of a large industry. The transmission company now has three customers in Fitchburg using over the 300-hp limit set by the commission in the decision upon that appeal, with possibly 10 consumers of this size. In Clinton it is planned to supply the Bigelow Carpet Company, the largest concern in the city, with 4000 hp. The principal customer in Worcester will be the American Steel & Wire Company, although there are about 160 possible customers in Worcester who take over 50 hp each. Mr. Harriman said that his company has acquired other rights than those at the Vernon dam, and plans to develop them as soon as the power market warrants. Mr. Burdett said that the transmission company can sell all the power generated at the Vernon plant within a comparatively short time to large customers, which means a comparatively small distribution expense in any particular center of consumption. No prices have been quoted in Worcester to customers of less than 50 hp.

Mr. Fred H. Smith, electrical engineer of the Worcester company, testified that the total available capacity for power service alone is about 3500 kw. The maximum power load is now about 500 kw, but within four weeks the demand is expected to be 1000 kw. The new rates will doubtless stimulate business. The total capacity of the plant for all purposes is about 5000 kw. There are now between 500 and 600 motors connected to the system.

Mr. Burdett, in presenting the closing argument of the hearing, reviewed the principles established in the Fitchburg case and emphasized the action of the Legislature in setting a 300-hp limit in the charter of the French King Rapids Power Company and the similar action of the commission in the Fitchburg appeal. He argued that the transmission company's field is large power business; that it could not maintain its expected rates and meet the ordinary charges of local distribution; that a water-power company cannot sell to a small user much cheaper than a well-equipped and operated steam plant, and that a much larger limit than the Aldermen fixed is necessary. He stated that the Mayor's figures were of data prepared in 1908, whereas the new power schedule submitted earlier in the hearing compared favorably with any other city of the same size in the country. Regarding the charges that Worcester had been remiss in the development of power business, he reserved the right to answer the Mayor's brief in full at a later date, if necessary. It was important to realize, however, that gross income is not the measure of profits, and that in some cities the net income is reduced by the taking on of unprofitable business.

Chairman Barker, in concluding the hearing, announced that the commission would give the situation the closest study and render a decision at the earliest date consistent with the importance of the subject.

Hearing on Economic Company's Franchise Case.

A hearing on the application of the Economic Power & Construction Company for approval of its franchises and construction at Geneva, N. Y., was held by the New York Public Service Commission, Second District, at Albany, on Sept. 8. Chairman Frank W. Stevens presided.

Mr. Herbert P. Bissell, for the Economic company, then stated the grounds upon which its petition was based. It was incorporated under a special act of the Legislature, which granted the right, Mr. Bissell said, "to enter upon and use the ground or soil in any street, avenue, public place or premises, etc., without other or further authority of law or ordinance: and that the question of the validity of this feature of the grant was tested in the courts of the State and a decision rendered by the equity term of the Supreme Court, sitting at Buffalo, validating the grant, and that that decision was afterward affirmed by the Appellate Division of the Supreme Court, sitting at Rochester, and that thereafter on appeal the decision of the equity term, affirmed by the Appellate Division, was reversed."

The Economic company acquired the bonds and stock and property of the Geneva Steam Heating Company. Following the absorption of this property a 20-year contract was made with the city of Geneva for the use for the distribution of electricity of the ducts which the city owned in the streets. Recognizing the obligation under the present construction of the law governing the Economic company, Mr. Bissell had come to ask the approval of the construction already done in so far as it related to the manufacture and distribution of electricity and the laying of any work in the streets, and also to ask for the right to proceed further with the plant at Geneva. He also wished to enter an objection against the right of the Geneva-Seneca Electric Company to object, declaring that that company had no franchise in the city of Geneva.

Mr. J. A. Bendure, constructing engineer of the Economic plant in Geneva and general manager temporarily of that company, testified that the Geneva plant had distributed electric light and power since June 1, 1908. It started with 42 consumers for electric light and power and now had 76. It was distributing during 10 hours a day an average of 70 kw for power and light, and from 6 until 10 p. m. an average of about 50 kw per hour. The business had been extended somewhat during the summer and could be extended more. Mr. Bendure stated that with one exception the rates were unchanged from those scheduled by the Geneva-Seneca company. About $40,000 had been expended in changing and re-equipping the plant of the Geneva Steam Heating Company. The receipts from the sale of electricity from June 1 to Dec. 1, 1908, were $3,030.03; the expenses for the entire plant, including the steam heating, were $5,154.28.

Commissioner John B. Olmsted asked the witness, if the rates were practically the same, what benefit inured to the public from the entrance of the Economic company. The witness said that his company gave better service.

Mr. W. S. O'Brien, corporation counsel of the city of Geneva, stated that the Economic company was to pay an annual rental of 5 cents per lineal duct-foot for the conduits leased, together with 100 kw electricity for lighting purposes each month. That provided a net annual revenue of between $400 and $500, or about 10 per cent on the investment of the city. The performance of the contract was secured by a bond for $25,000 filed with the board of public works. The franchise granted to the Economic company reserved to the city the control of the streets, and that was one of the principles for which the city authorities were striving.

Answering a question as to the franchise of the Geneva-Seneca company, Mr. O'Brien said that all that he could say was that he had been unable to find it. He had never been able to find one except as embodied in the public lighting contract.

Mr. Lansing G. Hoskins, attorney for the Geneva-Seneca company, said: "You have found resolutions outside of the public lighting contracts authorizing this company's predecessor to string wires and erect poles in the streets."

Mr. Bissell stated that the testimony of which the foregoing is an abstract represented the case of the petitioner, reserving the right to show that there was no franchise and the right to rebut.

Mr. Lewis E. Carr, of counsel for the Geneva-Seneca company, said he could not conceive that what had been offered made out any case justifying the application. He thought he would enter on the minutes a motion on the part of the Geneva-Seneca company to dismiss the application on the ground that the facts did not justify the grant of the permission asked.

Chairman Stevens said that before passing on this motion it

was due to the applicant to say that when the application was received the commission held an informal conference and he was instructed to rule that in view of the decision of the Court of Appeals the commission would have to treat the applicant as a new company making an appearance, so far as the purposes of proof were concerned, and it would have to adhere to precisely the same rules which it had in other cases. The commission reached that conclusion as a mere matter of practice without in any way prejudging any question which might arise. The case that had been made at the present time was that the applicant went into the city of Geneva and commenced to furnish electric light without a franchise from the city and without the consent of the commission; it did so under a claim of right and a charter which apparently gave, according to its terms, that right from the State. It had the decision of the Supreme Court upholding its rights. The Court of Appeals had held, on the other hand, that it had no such rights. It raised the question of who took the chances that the company was wrong when it went into Geneva under those circumstances. Did it take the chances or did the existing company take the chances? If Mr. Bissell desired to argue in any way that this view of the commission was wrong, the commission would be glad to hear him. If he acquiesced in that view, he would have opportunity to furnish further evidence.

Mr. Bissell stated that the company now had a franchise from the city of Geneva. There was some evidence that the company was needed at Geneva. Chairman Stevens said that where there was an existing company in the town the commission held that an inquiry must be made into the facilities afforded by the company and as to whether it was rendering proper and adequate service to the public. In the Niagara Falls case, although the Common Council of the city had granted a franchise to the applicant, the application was denied by the commission for the reason that the existing company was furnishing adequate service at adequate rates, except in some matters of service which were within the power of the commission to correct, and which it did correct, and also except as to some rates which the commission required the existing company to change in order to make them fair and reasonable. It exercised its powers over the existing company to correct whatever evils existed, and with those corrections made there was no reason for another company in the city.

In other cases the commission had granted franchises.

Mr. Bissell, in response, said he could not believe that a commission would undertake to overrule a grant from a city where a condition existed such as had been shown by Mr. Bendure.

Chairman Stevens answered that the commission had never apprehended that it was to receive the decision of the Common Council as final and conclusive, and it could conceive of no reason why it should.

Mr Bissell said he should have said that it was very important evidence of the necessity of this company.

Chairman Stevens stated that the action of the local authorities always should be given some weight and some importance in these matters, but it was not to be conceived of that they were controlling in view of the fact that the Legislature had created another body to pass upon the franchise and had endowed it with power to say whether a franchise that had been given could be exercised.

Mr. Bissell asked for a hearing at Geneva at which citizens could testify concerning the situation.

Chairman Stevens said that the commission also felt that it ought to inquire into the financial organization of the Economic company. In previous proceedings it had been disclosed that the capital stock was $50,000, of which $48,000 had been issued as consideration for certain patents, which, he assumed, had expired by this time and which certainly related to something other than electric lighting. The property at Geneva was under a mortgage for its full value. In a case of this kind the commission went into its financial organization to see that it was organized in such a manner that it would be capable of carrying out its duties to the public as it should; if it should incur some liability by reason of accident, whether it would be able to respond in damages. In other words, the commission thought there should be a full understanding of the relation of this company to the holding company.

Mr. Carr said that the contention of the Geneva-Seneca company was that under the decision of the Court of Appeals the Economic company had no right to do what it was seeking to do in Geneva, not even with the permission of the commission.

The hearing was adjourned until Sept. 23 at Geneva.

Convention of the Pennsylvania Electric Association.

The annual convention of the Pennsylvania Electric Association was held at The Forest Inn, Eagles Mere, Pa., on Sept. 8, 9 and 10. This association was organized at Eagles Mere last September, as the first State chapter of the N. E. L. A., with 41 Class A members, no Class B members and 6 Associate members.

President L. H. Conklin, of Scranton, in his opening address reported that there are now enrolled 72 Class A members, 235 Class B members and 15 Associate members. There were about 200 present at this convention as against 85 last year. Following the president's address were the reports of the secretary and treasurer and reports of the committees on by-laws and overhead line construction. The report of the latter committee was in printed form, presented as a special guide to the Pennsylvania companies in the application of the recommendations of the recent report to the N. E. L. A. on this subject. It was felt that these data could be made particularly useful to Pennsylvania companies if the certain portions applying to the special conditions in Pennsylvania were revised and emphasized.

The report dealt with detailed specifications covering the methods for pole-setting, pole-guying, attachment of cross-arms, and for stringing of wires thereon, together with specifications for material in connection with the work covered, which specifications apply to series street lighting circuits and constant-potential circuits for e.m.fs. not exceeding 2300 volts.

In discussing this report Mr. Orr, of Pittsburgh, said that the importance of standardizing material could hardly be exaggerated, as it unquestionably leads to better material and better prices. He recommended the continuation of the present committee.

Mr. Greene, of Altoona, in speaking of his experience with poles, stated that he considered second-growth chestnut poles most satisfactory. On account of the difficulty he had had in securing poles, he has made it a practice to buy a year in advance and allow the poles to weather, piled up on skids, so as to be raised off the ground. He finds that these poles have twice the life of the green pole.

Mr. McCabe, of Lewiston, said that he had found that poles cut in February are far superior to those cut at other seasons of the year, as at that time they are entirely free from sap. He uses white pine cross-arms, air dried, and, before putting them into service, fills up all cracks and holes with putty and gives them a coat of white lead.

Mr. Camp, of Philadelphia, stated that the kind of pole which gives the best service depends largely on the nature of the ground. He has found chestnut poles superior in some localities, while in others Michigan pine, Maine cedar or Georgia pine was more lasting. Great interest was shown in the subject of poles and there was strong sentiment in favor of a further investigation on the part of the association.

In addition to the regular program, a list of "Pertinent Questions" had been prepared and distributed among the members. In answer to the question, "Have any of the member companies experimented with, or do they know anyone who has used, concrete poles for electric lighting pole lines?" Mr. Orr, of Pittsburgh, stated that the Allegheny County Lighting Company has done considerable experimenting with concrete poles, with very good results. This has been largely the reinforcing of partly decayed poles. Mr. Orr stated that a 35-ft. or 40-ft. pole can be reinforced for about $3.

Mr. Scroll, of Philadelphia, said that the cost of transportation and the hauling and handling of concrete poles are prohibitive.

Mr. Orr asked for the experience of the members with iron cross-arms, and a general discussion ensued; it seemed to be the sense of the convention that the use of iron cross-arms under ordinary conditions introduced an element of danger and weakness.

At this point, and before taking up the regular program, President Conklin introduced President Frank W. Frueauff, of the N. E. L. A., who addressed the convention and was very warmly received. Mr. Frueauff made a strong appeal for co-operation with the national association and outlined the mutual advantages which would be obtained. Mr. Frueauff announced that on Oct. 1, Mr. T. C. Martin, well known to the industry as editor of the *Electrical World*, will become permanent secretary of the N. E. L. A., to devote his time to the service of the member companies.

The paper on "Steam Heat in Connection with Central Stations," by Mr. Paul Muller, of Erie, was read by Mr. Fogerty, also of Erie, as Mr. Muller had been unable to reach the convention.

In this paper Mr. Muller expressed the opinion that as a matter of economy one can afford to drive generators by simple engines and dissipate the electrical output in rheostats merely for the return obtained from exhaust steam heating.

The paper called forth a very warm discussion. Mr. Byle, of Westchester, in answer to criticisms by Mr. Penrose, stated that in the operation of a heating plant, he had found that in the evening, after a hard day's service, as the peak of the electric load comes on and he is able to turn more exhaust steam into the mains, the load on the boiler seems to decrease, and often the furnace doors are opened to check the pressure.

A motion was passed that a committee be appointed to investigate and report on the subject of steam heat at the next meeting of the convention.

The session was concluded with the reading of paper by Mr. A. R. Cheyney, of Philadelphia, on the subject of "Plant Economies with Special Reference to the Boiler-Room."

This paper gave an analysis of the various losses encountered in the boiler-room of a central station. The purchase of coal on a heat-unit basis was highly recommended. The essential requirement in furnace operation is the conversion of the coal into the maximum of carbon dioxide with the minimum loss of the heat units thus liberated. In conducting the firing of boilers it is well to note that the use of any boilers in excess of those absolutely needed is productive of waste and of low station economy; moreover, the greater the overload range of the boiler the less the cost of producing each kw-hour.

In discussing this paper, Mr. Graves, of Pittsburgh, stated that in the analysis of coal attention was paid to the heat units, sulphur and ash, but the careful regulation of the sulphur has been productive of the best results.

Mr. Orr told of a contract which provided for a system of penalties and premiums, depending on the analysis of the coal supplied, and which has worked out very successfully. It has led to a very healthy competition among the coal companies on a basis of strict quality. Mr. Orr recommends the use of the recording CO_2 meter as a check on the firemen.

President Conklin stated that he had been carrying on some experiments in Scranton in the utilizing of the culm piles. His company owns three very large culm banks, and is testing various mixtures of culm with different grades of anthracite, bituminous, washed coal, etc. Mr. Conklin expects to be able to report on this experiment in the near future, and offers the data to the members of the association.

Thursday's session was devoted to commercial subjects and the meeting was presided over by Mr. Duncan T. Campbell, of Scranton, chairman of the Commercial Day Program Committee.

The first paper was presented by Earl E. Whitehorne, editor of *Selling Electricity*, New York, entitled, "Dollar Ideas." This was followed by a paper by Mr. Van Dusen Rickert, of Pottsville, on the subject of "Methods of Securing New Business," a paper by Mr. R. A. Granger, of Chester, on "Commercial Effects of Tungsten Lamps," and a paper by Mr. D. T. Campbell, of Scranton, entitled "Advertising Direct and Indirect."

The paper entitled "Dollar Ideas" discussed the advantages of various schemes for popularizing the use of electricity. The schemes included window displays, porch lighting, public fans for cooling purposes, and advertising in the local papers.

The methods treated by Mr. Rickert related to business lighting, signs, windows, outlining and decorative features, and electric service in small residences. In discussing window lighting the statement was made that such use of electricity should be considered as advertising and not as illumination, and flat rates can well be given for this service.

In the paper by Mr. Granger it was stated that a growing demand for tungsten lamps has been noted by the central stations. Generally the policy adopted is to secure business heretofore unobtainable by the use of the lamps. Their use is encouraged to displace gas lamps and for satisfying disgruntled customers. The tendency is to increase the illumination, using about the same value of watts as formerly when replacing carbon incandescent lamps.

The paper of Mr. Campbell dealt with the successful methods of reaching the public through advertising. Particular emphasis was placed upon overcoming the false impressions of the central station and making the public understand that electricity is at its service at all times. The advertisements should be so arranged as to educate the reader concerning the advantageous features of electric service.

These four papers were discussed jointly, the discussion embracing the various phases of the central-station selling problem.

Mr. McCabe, of Lewiston, asked for information as to the policy of member companies toward making long extensions for churches, citing an instance where he was asked to connect a small Lutheran Church, 800 ft. from his lines. The general opinion seemed to be favorable to the connecting of churches, if possible, in consideration of the impression which it makes on the church members.

Mr. Granger told of an arrangement whereby the customer pays half the cost of the line extension which is rebated as new customers are secured along the line.

Mr. Greene, of Altoona, gave an interesting account of a farm installation situated six miles from his station, which brings in a revenue of about $200 a month, there being a full equipment of motor-driven churns, saws, etc.

In speaking of the tungsten lamp, Mr. Barton, of Philadelphia, warned the members against letting enthusiasm run away with better judgment, as the market for carbon lamps for use in closets and out-of-the-way places will continue for many years.

Mr. MacGregor, of Easton, cited an experience in a Western city where gas had been supreme. When the tungsten lamp was placed on the market, he succeeded in installing 75 four-lamp tungsten clusters inside of three weeks, with a very marked effect on public opinion.

Mr. W. C. Anderson, of Plymouth, then read a very interesting paper on the subject of "Co-operation with Contractors." He cited the experiences of the Luzerne County Company and the Allentown Electric Light & Power Company to show that it is best for the central station not to conduct wiring business unless by reason of keen competition between two companies it becomes necessary to take special action to meet special conditions.

The discussion of this paper was opened by Mr. Fogerty, of Erie, who stated that his company had been forced to do contracting and carry supplies. It sells annually about $20,000 worth of supplies, $30,000 worth of fixtures and secures revenue from wiring ranging from $3,000 to $5,000. Customers are required to pay for a part of the cost of extensions on a yearly percentage basis. Mr. Fogerty said that he had made some interesting experiments to determine the practical life

of the tungsten lamp and in one case a 60-watt lamp had burned over 3500 hours.

Mr. Hoffman described a very effective system in vogue in Philadelphia. The Philadelphia Electric Company has a standing offer of 25 cents per socket which is paid to any builder who secures the installation of electric wiring in any building he may erect. This arrangement has been in effect since 1896, and in one section where 196 houses have been built the cost for extensions, etc., has been about $3,500. The first year's revenue from 149 of these houses was somewhere in the neighborhood of $4,250, the other 47 houses being unoccupied. Some 4900 16-cp equivalents were installed, the bonus to the contractors amounting to over $800. These figures are approximate.

The session closed with the reading of a paper on "Power," by Mr. E. T. Penrose, of Tyrone. This paper represented an attempt to prove that the small central station in a manufacturing town should maintain a 24-hour service, and that the success of a central station depends upon its day load. The value of off-peak business, its influence on the cost of the kw-hour, the monetary value of a high-load factor and methods for obtaining a day load were discussed by Messrs. J. W. Reeves, T. E. Spence, J. B. Kilmore and R. A. MacGregor as assistant editors.

In connection with this paper Mr. Penrose submitted a number of selected data sheets, from figures which he had secured from various parts of the country, covering specific installations. These figures are worked out through successive stages to show the consumption per unit of product. Mr. Penrose made a strong appeal for co-operation in the circulation of such data.

Mr. McCabe, of Lewistown, decried the tendency of central-station men who conceal exact motor rates. He urged all members to join hands in the movement and show liberality in the interchange of real facts and figures.

Thursday evening was devoted to a lecture by Prof. E. E. F. Creighton on the subject of "Lightning and Lightning Phenomena." There was a large attendance of members, guests and ladies, and the experiments were exceedingly interesting.

The Friday session was scheduled to open with an address by Mr. T. C. Martin, of the *Electrical World*. Mr. Martin was unfortunately unable to be present and his address was read by the secretary.

Mr. E. B. Greene, of Altoona, read a paper on the "Commercial Value of Constant and Efficient Service," in which it was claimed that when the service is entirely satisfactory a normal growth or increase of business of 10 per cent per year may be expected. Moreover, an honest effort to correct any real or imaginary lack of constant service will tend to increase the receipts. To be able to realize the value from efficient service requires an organization composed of trained men who work in thorough harmony.

Mr. Rickert, of Pottsville, took exception to a statement by Mr. Greene that the cost of a lapse of service could be computed at 2 cents per minute per inhabitant. Mr. Greene explained that this was based on the number of customers effected. There was a general discussion in which Mr. Granger, of Chester; Mr. McCabe, of Lewistown, and Mr. Hoffman, of Philadelphia, cited instances where a lapse of service meant actual damage and expense to consumers.

This was followed by a paper on "New Methods and Specifications for Street Lighting," by Mr. J. H. Perkins, of Wilkes-Barre, which called attention to the confusion that has been caused by the initial rating of the old open arc at "2000 candle-power," and reviewed the conditions leading up to the work of the National Electric Light Association in forming specifications for street lighting based upon the distance at which an arc lamp must be placed from an object in order to light it with the same density of illumination as a standard 16-cp lamp. These specifications insure the obtaining of a certain foot-candle of illumination along the street.

In discussing this paper, Mr. Davis, of Williamsport, urged the adoption of the foot-candle as the unit of illumination in street lighting, as it enables the company to take advantage of new apparatus which may give better results in the illumination at a lower initial candle-power.

Mr. Scroll, of Philadelphia, heartily endorsed this recommendation. He stated that it is dangerous to make official tests of lamps in place, inasmuch as the figures will be materially effected by pavement, color of adjacent buildings, atmospheric conditions, season, etc. Marked interest was shown in the subject of street-lighting contracts, and a recommendation was made that the association secure further data on the subject.

At this point the meeting went into executive session to receive the report of the nominating committee. The nominating committee moved the re-election of present officers. President Conklin, however, after expressing his appreciation, urged the association against the establishing of such a precedent and asked that the matter be reconsidered, as he felt that it would serve the best interest of the association if the term of the chief executive were limited to one year by custom, if not by law. The committee took the matter under further consideration and the following officers were nominated and elected:

President, E. L. Smith, Towanda; vice-president, A. R. Granger, Chester; secretary, Van Dusen Rickert, Pottsville. Members of the executive committee: R. S. Orr, Pittsburgh; E. F. McCabe, Lewistown; J. H. Perkins, Wilkes-Barre, and M. J. Fogerty, Erie.

The balance of the session was given up to further consideration of commercial subjects and a motion was passed instructing the executive committee to consider ways and means to secure adequate legislation for protecting central stations against theft of electricity.

First Convention of New England Section, N. E. L. A.

The first convention of the New England Section of the National Electric Light Association was held at the Hotel Wentworth, Newcastle, N. H., on Sept. 8, 9 and 10, with an enthusiastic and representative attendance of central-station officials, manufacturers' engineers, ladies and other guests. There was a total registration of about 150 at the headquarters established in this renowned hostelry. The historic scenes in the vicinity lent an added charm to the meeting, and by the evening of the eighth many members and guests were on hand to attend the reception which was given by the officers in the hotel parlors. In the receiving line were President and Mrs. S. Fred Smith, of Salem, Mass.; Vice-President and Mrs. James E. Davidson, of Montpelier, Vt.; Secretary C. H. Hodskinson, of Boston; and Mr. Alexander J. Campbell, of the executive committee, and Mrs. Campbell, of New London, Conn.

The first business meeting occurred on the morning of the ninth, with President Smith in the chair. Mayor Adams, of Portsmouth, made a witty speech of welcome, and President Smith delivered a forcible address reviewing the circumstances which led up to the formation of the New England geographical section, the advantages of coalescing the previously scattered local associations with the national body, and the development now in prospect. To-day there are 413 members in the New England section, and it is the most powerfully organized section of the association. The thoroughness with which the geographical section can work, as compared with an unwieldly larger body requiring parallel sessions, was emphasized, although the importance and value of the prestige and strength of the national organization were not overlooked. In conclusion President Smith commended the plan of inaugurating geographical sections by combining several States in a group, rather than keeping close to State lines and thus multiplying organizations.

LIABILITY INSURANCE.

The first paper read was by Mr. Walter L. Mulligan, general manager of the United Electric Light Company, Springfield,

Mass., on "Liability Insurance and How It Affects the Employee," and is abstracted below:

The United Electric Light Company has for a number of years carried both public and employees' liability insurance, but has never believed in the policy of letting the insurance companies handle the cases alone. About 150 men are insured, excluding the office force. When a man enters the company's service it is understood that he is to obey orders, and if he is hurt in any way the company takes care of him and puts him as nearly as possible in his normal condition, without loss of pay, provided he does not bring suit. This obviates the grumbling in front of unpleasant tasks and induces loyalty to the company. Care is taken in the selection of men, and if a man shows any signs of carelessness the company tries to drop him before he can injure himself or its property. When a man is injured the company gives orders for him to have the best of everything if hospital treatment is needed, letting him select the hospital if he is able to do so. The accident is then investigated and a complete report given to the insurance company, no matter how small the injury may be.

The company does not feel that it pays to let the insurance people deal with employees directly, although that method is pursued in connection with public liability policies. There are, of course, quite a number of small cases during the year where a man may be laid up for a few days on account of some minor accident, and in all such instances the insurance company is not asked to pay anything unless the employee tries to make trouble, which rarely happens. The company assumes the doctor's bill and pays for the man's time, and has the insurance company behind it in case of need. This method saves the insurance company money and inclines it to be more liberal in settling cases into which it is called. The total amount of money paid out last year for liability, team, fire, automobile, and property insurance was $2,500, the liability portion representing about $1,700.

Discussion.

The discussion was largely made up of questions addressed to the author, who stated that the company endeavors to treat each man in the fairest possible way, paying his wages regardless of the responsibility for the accident, and before the liability is determined; looking after a man who is partially disabled, and providing in reason for a man's family according to circumstances; and in general making the men feel that they will be taken care of when an accident occurs. There is no agreement covering sickness, but recently an employees's benefit association has been organized for that purpose. The company has leased two rooms for the association, and intends to have practical talks there, and to equip the place with newspapers, etc.

Mr. H. T. Sands, of the Malden Electric Company, cited a case where an employee was injured by an accident to a coal-handling equipment, but who sued the central station with much less satisfaction than as though he had relied upon the company's fairness in settling the claim.

President James E. Davidson, of the Consolidated Lighting Company, Montpelier, advocated a liberal liability insurance policy, but felt that there is room for lower premiums. He has paid about $2,000 per year for a force of 35 men.

Mr. R. W. Rollins, general manager of the Hartford Electric Light Company, said that up to four years ago a 2 per cent premium had been paid by him to insurance companies for liability protection. The companies proposed to raise this to 4 per cent, and so the Hartford organization decided to insure itself, in both employees' and public liability. A better handling of the cases with employees is a notable result.

Mr. A. J. Campbell, of New London, made a strong plea for a revised attitude on the part of central stations toward employees' liability. The insurance companies are forcing the wrong attitude. The moment a man is hurt is the time to get closer to him. The New London company is putting money in the bank now by insuring itself, and in a few years it is hoped that the sum will be sufficient to enable the size of the present payments to be reduced. It is better to pay directly to the man than to contribute to hospitals and relief agencies in general.

Mr. L. D. Gibbs, assistant advertising manager of the Boston Edison Company, emphasized the importance of a liberal policy in relation to accident compensation in connection with the loyalty of employees and showed that the selection of high-grade men was a natural result of such methods as those practised in Springfield. If the employee feels that he will be protected by the company, loyalty is bound to be increased. The publicity which a satisfied, loyal employee can effect in favor of the company is very valuable.

Mr. C. D. W. Jarvis, of the New England Telephone & Telegraph Company, stated that his organization carries its own insurance for both the public and employees, and does much in the way of providing for sick employees. A most important point is to establish a standard of construction so high that accidents will be prevented in the first place.

Mr. Wilson, of the Berlin Electric Light Company, New Hampshire, described an employees' liability association in his organization. There are about 2000 men in its service, including large industrial enterprises under control of the company. Once a month a certain amount is taken from the pay of each member and put into a fund from which half wages are paid in case of disability. At the end of the year a dividend is declared and paid to each member on any balance remaining. The insurance is handled at cost, and the expense last year was less than $2 per employee. President Smith concluded the discussion by stating that in Salem it begins to look favorable for the company's insuring itself instead of paying the underwriters.

STEAM HEATING.

The next paper was by Mr. Charles R. Bishop, general manager of the American District Steam Company, of Lockport, N. Y., on "The Advantages of Steam Heating for Electric Lighting Companies."

Mr. Bishop emphasized the development of the past 30 years in central-station heating and urged the more general consideration of this subject in the New England field. Companies have doubtless been waiting for the full development of steam heating, but now methods of construction and operation have become thoroughly standardized; and equitable methods of charging have been introduced through the development of accurate meters. He reviewed the early experiments in the heating field. In New England there are 172 cities having populations of over 5000 each; but in only three are there steam-heating systems of any magnitude; while Pennsylvania, with 82 cities of over 5000 inhabitants, has central-station heating plants in 69 cities. Illinois has 30 systems in 51 cities of 5000 or over. Steam heating is a success as far south as Birmingham, Ala., where snow is almost unheard of and the mean winter temperature is higher than the mean temperature of October alone in New England.

There is as good a market for steam heat as for electric light and power. Mr. Bishop emphasized the point that many companies are manufacturing heat in the form of eletcricity at an efficiency of utilization of from 8 to 14 per cent, and throwing the balance away, either into the atmosphere or into condensers. It is perfectly practicable to sell this amount of energy otherwise lost for a price that will pay the original fuel cost, including water, oil, waste, and labor in boiler and engine-rooms. Companies are doing this and also earning interest and depreciation on the cost of the steam-distributing system. One company generated 1,903,000 kw-hours during the heating season at a total cost in the station, including coal, water, oil and waste and power-house labor, of $26,863. Its receipts from steam heating were $37,190. The steam investment outside the station, including street mains, services, trenching, repaving, street traps and meters was $122,000, and the total space heated was about 10,000,000 cu. ft. The season extended from Oct. 1, 1908, to May 25, 1909. The plant is a combination heating and lighting station operated for three years in a city of 17,500 population.

Mr. Bishop stated that as a general rule a fair heating price per 1000 lb. of steam is one-tenth of the price per ton which the customer has to pay for coal. This will enable the customer to save money by buying central-station heat and give the company a proper return as well. Another interesting manner of studying the foregoing actual results from practice is to add to the actual generating costs interest and depreciation on the investment for the steam main equipment, which is not properly an item of generating cost, but which is included for the sake of getting any cost whatever per kw-hour. In the first plant such an addition of 10 per cent to the generating cost, with deduction of the receipts from the sale of steam, gave an energy generating cost net of a little under 0.1 cent per kw-hour at the switchboard. In the second plant the unit cost drops to 0.5 cent by adding this charge and deducting the steam-heating revenue. Here the heat customers are using steam for only about two-thirds of the previous cost to them when generating with their own equipment, and hence the company's rate should be 50 per cent higher with a corresponding increase of revenue. In the third plant cited the net switchboard cost came to 0.32 cent per kw-hour. Here the steam charge was about 50 per cent too low.

In order to insure success in district steam heating, Mr. Bishop stated, the climatic conditions should insure a good market for the sale of steam; the generating station should be reasonably adjacent to the district in order to reduce the investment necessary; the rate should be well within the economic limits of the consumer, and still pay a satisfactory profit on the investment over and above the cost of manufacturing steam, including depreciation and amortization; the management should be efficient and the steam metered; the total amount of business should be large in relation to the possible market; and standard methods based on experience should be used. Where the heat is supplied by exhaust steam the heating demand during the minimum period should equal the full amount of exhaust steam from any single engine unit. Station piping should be arranged so that any engine can be operated condensing, non-condensing, or under back pressure while supplying heating steam, without reference to the other units in the station. This can be effected without much additional cost for piping, but when neglected is apt to result in back pressure being carried on a portion of the engine plant without compensating advantages. To secure the best results the demand for heating should be slightly in excess of the total amount of exhaust steam available at all times. In the modern steam main for district heating the drop should not be over ¼ lb. per 1000 lineal feet of main. Cumulative sliding scale rates are usually adopted. A very important factor is the additional electrical business which can be secured in connection with the ability of the central station to supply heat and shut down the isolated plant. With an extensive heating plant operated in connection with a lighting and power business, one is practically insured against a competing plant being installed, even though the threatened competition be a hydro-electric proposition.

Discussion.

The discussion centered on the importance of preventing some of the present waste of fuel and on the technical details of service. None of the members had had experience with this service on any considerable scale, but much interest was shown in Mr. Bishop's paper. Questions brought out the point that a two-mile transmission is feasible commercially, the distance being measured in a direct line from the station. It is advisable to operate the condensing portion of the power plant on the summer load. It is not necessary usually to guarantee more than from 1 lb. to 2 lb. service pressure at the entrance of the heated building. In Detroit, St. Paul, Adrian, Mich.; Springfield, Ohio, and Birmingham, Ala., steam turbine plants are operated in connection with steam exhaust heating service.

ENTERTAINMENT FEATURES.

On Thursday afternoon the members and guests embarked on the steamer *Alice Howard* for a sail around the bay, stopping at the Kittery Navy Yard, visiting the Conference Chamber, where the Peace Treaty was signed by Japan and Russia, and then inspecting the power plant of the Rockingham County Light & Power Company, in Portsmouth, where refreshments were served. The ladies of the party were taken around Portsmouth during the afternoon by courtesy of the Portsmouth Board of Trade and shown many historic points of interest, with a tea at the Hotel Rockingham. In the evening a banquet was held in the dining-room of the Wentworth, and the entire registration, including ladies, were present. The floral decorations and favors were unusually attractive. Mr. L. D. Gibbs, of the Boston Edison Company, was toastmaster, and the speakers were Messrs. J. S. Whitaker, Portsmouth; T. N. Brady, New Britain, Conn.; H. T. Sands, Malden, Mass.; A. J. Campbell, New London, Conn., and C. B. Burleigh, Boston.

On Friday morning the ladies of the party were taken on an automobile ride southward along the seacoast to Rye Beach.

FRIDAY BUSINESS SESSION.

President Smith called the session to order about 10:30 a. m., and introduced President Frueauff, of the National Electric Light Association, who with Secretary-elect T. Commerford Martin had just come from an enthusiastic meeting in Schenectady, where plans were effected for the forming of a company and local section attended by about 400 persons. President Frueauff brought the most cordial greetings to the New England section. He referred to the enthusiastic meeting at Schenectady, and then outlined the work which the several important committees of the association are taking up.

President Frueauff called attention to the library nucleus at the association headquarters in New York provided through the gift of Mr. W. D. Weaver, editor of the *Electrical World*, and extended a welcome to all members from the headquarter's office. He cited a case where a small company is obtaining the advice of the association's insurance expert through its membership at a nominal cost in a case where it has been sued for $90,000 on account of a fire, as a direct benefit of membership. Concluding, he wished the section the most complete prosperity and congratulated it upon the success of the first convention.

President Smith then announced that Mr. T. Commerford Martin, editor of the *Electrical World*, had recently accepted the post of secretary of the National Electric Light Association, and congratulated the membership that, after many years of distinguished service in the journalistic field, Mr. Martin has been induced to take up the work of the association in a more intimate official capacity, with a keen appreciation of the future opportunities and possibilities of the organization.

Mr. Martin was then called upon, and made a felicitous and inspiring address on the regret with which he lays aside his work in technical journalism, the ability and enthusiasm of the staff which he leaves behind him, the high heritage into which the National Association membership has entered, the important work which lies ahead, the opportunities of the secretary in maintaining a clearing house of information for all sections of the country, and the possibilities of co-operation in supporting and promoting the welfare of the association.

Chairman Campbell, of the committee on the president's address, then presented his report, recommending that it be placed in the hands of each section member, and particularly recommending that efforts be made to cultivate friendly relations with central-station men in municipal plants. The committee's report was unanimously accepted. Resolutions of thanks were then passed for courtesies extended during the convention by the Portsmouth Board of Trade and the Rockingham County Light & Power Company.

LOW-VOLTAGE TUNGSTEN LAMPS IN RESIDENCE LIGHTING.

The first paper was on "The Low-Voltage Tungsten Lamp in Residential Lighting," by Mr. Frederick W. Prince, of the Hartford Electric Light Company.

Mr. Prince reviewed the commercial difficulties introduced by the advent of the tungsten lamp into residential service and said that with meters costing $4.50 per year to maintain and doing only 40 per cent of the work formerly done with the carbon lamp, the only satisfactory solution seems to be the introduction of the low-voltage tungsten lamp. The tungsten

low-voltage lamp has a slow, gradual increase in candle-power, does not blacken to any extent, and by a slight sacrifice in efficiency can be made to have a life of about 2000 hours. It overcomes the principal faults of the carbon lamp and in low voltages can be made in a candle-power of 10 and even lower. This is a great advantage in residential lighting. The 30-volt or 60-volt tungsten allows of ordinary handling with almost no breakage, compared with a 19 per cent loss in breakage with the 120-volt tungsten lamp. The price of the low-voltage lamp is only about 65 per cent of the high-voltage unit, and it can be made from the short cuttings of the high-voltage filaments. Since the filament can be mounted in an ordinary 10-cp or 16-cp lamp bulb, it is especially convenient in displacing existing lamps in residential fixtures. The short filament enables it to be burned at any angle.

The low-voltage system is adapted to present supply installations by the use of a transformer or balance coil with 112-volt primaries and four 28-volt secondary circuits. Extra taps are brought out on the primary side to admit of exact voltage adjustment on the secondary circuits. The first difficulty was found in large houses, owing to the drop in long distribution circuits at 30 volts. Under the low-voltage system a lamp of the same candle-power as the old carbon took half as much current again at one-quarter the voltage, so that the drop per candle-power was about six times that formerly obtained. This could be partially overcome by using the primary taps before mentioned, but when the transformer coil was installed on a residence circuit it rendered useless all the common flatirons, curling irons, fans, sewing-machine motors, etc., and circuits controlling this equipment had to be re-wired so as to remain on 112 volts. Both the drop problem and the latter difficulty were partially solved by adopting a 60-volt lamp. This cut the drop to only one-third more than the original loss. Most of the commercial heating apparatus can be made for 60 volts. The 60-volt lamp appears no more fragile than the 30-volt lamp, and it uses a standard 16-cp bulb. The consumption varies from 1.1 watts to 1.35 watts per candle-power. In the installation of a large number of transformer coils of the original pattern with only a two-wire, 112-volt primary difficulty was experienced in maintaining a balance on transformers and the three-wire aerial street system. There is now made a balance coil with a three-wire, 120-240-volt primary and a three-wire, 60-120-volt secondary. This coil simply reduces the whole house voltage suitably for the 60-volt lamp and retains the original balance on both the street and interior house wiring.

The Hartford Electric Light Company had 120,000 residential lamps on meters, showing a net income of $1.10 per lamp per year. This gave a good basis for handling the low-voltage tungsten on a flat rate, and the following proposition was made to the public:

Energy for 10-cp, low-voltage tungsten lamp....$0.10 per month per lamp
Energy for 20-cp, low-voltage tungsten lamp.... 0.15 per month per lamp
Energy for 30-cp, low-voltage tungsten lamp.... 0.25 per month per lamp

The first installation cost the customer 20 cents per lamp for all sizes. Renewals of all sizes are 10 cents each. The installation of the economy coil is free. Soon after the advent of the high-voltage lamp, customers purchased the 40-watt lamps and the company was obliged to install a maximum-demand controller, which causes the lamps to flicker when a lamp in excess of the number contracted for is turned on. Sensitive adjustments make the instrument act on only 12 watts excess load.

The Hartford company is carrying on an active campaign in the wiring of houses now using gas. A contract-job price of $35 is made, for which the house is wired on the three-wire system and six outlets provided. For these are furnished one three-light fixture, two two-light fixtures, one single-light fixture, one bracket and drop cord, or a total of 10 sockets. Thus, for an initial cost of $35 and $1 per month a man may have his house wired and burn 10 10-cp lamps. If the prospective customer demands a meter, his house is wired for the same price and carbon-filament lamps and a meter installed. Extra lamps can be installed at the original contract at $3.50 each, and extra lamp fixtures at the actual selling price. Two years ago the Hartford company wired 300 houses during the summer. Since June, 80 contracts for house wiring have been made. Most of them run in excess of the 10-lamp proposition, the average price paid the company being $51.99 for an average of 12 10-cp and three 20-cp lights at an average income per house of $1.65 per month.

Discussion.

In the discussion, Mr. Prince said that all the outlets in a residence are covered with the contract. Higher candle-power lamps are used in rooms where reading is to be done, and the lower sizes in hallways, etc. There are almost no complaints from customers. The cost of the economy coil and the flat-rate controller may be nearly the same as that of a meter, but there is practically no maintenance. By check meters the company found that the revenue from this new plan is about 6 cents to 12 cents per kw-hour.

Mr. Holbrook, of the General Electric Company, Lynn, said that at Fulton, N. Y., 28 contracts were secured by the introduction of the low-voltage lamp inside of two weeks, displacing gas in houses and small stores. The maximum demand was 9.6 kw for a connected load giving an annual income of $1,868.

Mr. Prince said that the large heating propositions are sometimes rewired and left on the meter. The loss in the economy coil is about 150 per cent of that in a meter, but there is no maintenance, reading or billing expense. There is not very much to be gained by customers' burning lamps extravagantly, as the renewals cost 10 cents each, and come in oftener.

In answer to the question whether the scheme might not appear to be a discriminating rate from the point of view of a State commission, Mr. R. W. Rollins, general manager of the Hartford company, said that he felt that the contract as made between the parties would stand. Any long-hour user is entitled to a lower rate than a short-hour user. The real test is that the company makes money on the proposition.

Mr. G. C. Osborn, of the General Electric Company, spoke of the recent improvements in the metallized-filament lamp's life, the 50-watt size running over 100 hours better than the old carbon lamps, to 80 per cent candle-power. The tendency is for the prices of high-voltage lamps to go down, with increased consumption of them. He advocated sustaining the 110-volt service and deprecated the reduction of voltage.

Mr. Rollins said that the central stations should all get together and buy enough of the low-voltage lamps to lower their prices. In his opinion, the 10-cp lamp is all right for residential service.

Mr. L. D. Gibbs, of the Boston Edison Company, then spoke strongly against the use of low-voltage lamps in residential service. He considers that even the 20-cp tungsten lamp is none too brilliant for satisfactory illumination. The central-station man should encourage the use of more light rather than less.

Mr. C. H. Hodskinson delivered a telling litttle speech on the future possibilities of the New England section and urged every member to get down to solid work in pushing the interests of the organization.

CONNECTICUT RIVER COMPANY'S HYDRO-ELECTRIC DEVELOPMENT.

The last paper was by Mr. H. I. Harriman, general manager of the Connecticut River Power Company, on the hydro-electric development of that organization. The plant was fully described in the *Electrical World* of Sept. 9, 1909, page 606. In addition to his description of the station and the line installation, Mr. Harriman emphasized the special hydraulic conditions encountered, necessitating the use of a third water-wheel designed to be operated under the lower head that occurs during times of high water. By this means the company can operate its generators at full capacity even in extreme floods. The gradual fall of the river at Vernon, where the plant is located, is a valuable feature. The company desires to be a wholesaler of energy rather than a seller of small power. Particulars of the distributing system and the general manner of handling the service were also given.

Discussion.

The discussion brought out the point that none of the lines of the company is run parallel to telephone circuits closer

than 100 ft. The lines are operated at about 60,000 volts. At crossings the towers are amply strong enough to avoid any danger of breaking. Brass caps of large size were placed on the insulators at crossings at the request of the telephone company, and no wire smaller than No. 0 is used in crossings. The private right-of-way for the line formed the most difficult part of the work. Over 400 rights had to be secured within 66 miles. In most cases a perpetual easement was taken at so much per tower. The most distant market is Worcester, 66 miles away. The minimum flow of the river is ordinarily about 1800 second-feet, but in extreme cases this may run as low as 1000 second-feet. In case the water supply gets low, the transmission company operates these steam plants as auxiliaries. In the average year it will not be necessary to use steam power over three months. Anchor ice is prevented by using a concrete arch construction in the forebay.

In the afternoon a brief business meeting was held in which the constitution and by-laws of the New England Section were ratified, and the meeting then adjourned, all those in attendance feeling that the first convention had been highly successful, with bright prospects for the future of the association, both locally and nationally.

Wisconsin Rate Commission News.

Whether the Wisconsin Rate Commission has jurisdiction over rates for electric lighting and power furnished a city when there is a specific contract existing between city and company is the most important question yet put before that body and is one that will be given much consideration.

The question has been raised in the application of the Darlington Electric Light & Power Company for authority to increase its rates. An increase would affect the city and it has stepped in to resist the application. It raises the point that the commission has no jurisdiction, since it has a specific contract with the company. Its attorneys maintain that the commission cannot go around the contract and has no jurisdiction either one way or the other. The commission heard arguments and citations of cases and decisions at great length. It has now allowed the parties several weeks' time in which to file briefs and these are expected to be voluminous. There is no question about the controversy going farther than the commission. The law gives a right to go into the Circuit Court and from there to the Supreme Court, so it may be several months before a final settlement is reached.

A point, similar to a slight degree, was decided in a Superior telephone case some time ago. The People's Telephone Company franchise provided for a certain number of free telephones for the city hall, the schools, etc. The commission immediately ordered this free service discontinued. In this case, however, the contract was held to be discriminatory and it was thrown out without hestitation. The Douglas County Telephone Company was also furnishing Superior with free telephones and was ordered to make a regular charge.

The Wisconsin Commission has received an application from the De Pere Electric Light & Power Company for authority to issue $10,000 in stock for improvements. The company is capitalized at $100,000 and has issued $50,000 worth of stock.

Boston Edison Return Filed.

The Edison Electric Illuminating Company, of Boston, has filed its return with the Massachusetts Gas and Electric Light Commission for the year ending June 30, 1909. The return shows gross earnings of $4,111,342 compared with $4,229,239 in 1908, the reduction being due to the recent cuts in the company's rates. The net earnings were $1,390,673 as against $1,577,262, and the balance for dividends was $1,194,971 as against $1,396,905. The dividend payments were slightly increased and a deficit of $229,418 was shown as compared with a surplus of $6,109 in 1908. This deficit is not considered a serious factor, and no change in the dividend rate is expected.

The management has expended money liberally for improvements that will increase the earning capacity and the business is expanding steadily. The income from the suburban companies recently absorbed will be considerable as soon as the economies of consolidation can be effected. The field for new business is very large in these suburban districts and with the better service and lower rates of the Edison company the use of electricity will increase largely. An analysis of the company's operations will be printed in a later issue.

New York Public Service Commission News.

At the first hearing before the Public Service Commission of the First District in regard to building a rapid transit line by assessment on the property holders, as provided for by the Travis-Robinson law, on the Eastern Parkway, Brooklyn, it developed that there was no unanimity of opinion as to the character of road that should be built. The majority of the property owners seemed to favor a subway, while many others argued that this would be too expensive. The matter was adjourned until Sept. 15.

Theodore P. Shonts, president, and Frank Hedley, general manager, of the Interborough Rapid Transit Company, have had another conference with Chairman Willcox, of the Public Service Commission, over the proposed subway routes, and it is intimated that some sort of an agreement will probably be reached. The commission is determined that the Broadway-Lexington Avenue route shall be built in its entirety and it is not unlikely that the Interborough officials will accept this ultimatum. So far nothing has been done toward asking for bids on rapid transit routes, but now that the members of the Board of Estimate and Apportionment are back from their vacations it is believed that the matter will soon be taken up.

The officials of the Third Avenue Railroad have furnished the Public Service Commission with estimates of the amount of business it is expected will be done on the new Queensboro Bridge line for which a subsidiary company has been organized. It is estimated that by operating three cars on a five-minute headway that 2700 passengers can be carried daily and that a net profit of about $13 per day can be earned above all expenses and fixed charges. The commission has taken the franchise application under advisement.

As the Public Service Commission has refused to approve the franchise of the South Shore Company over the Queensboro Bridge, and as that structure is still without transit facilities, Bridge Commissioner Stevenson has submitted to the Board of Estimate and Apportionment a plan for the immediate establishment of a temporary municipal trolley line. It is proposed to rent the cars from the South Shore Company and buy energy from the New York Edison Company. The rate of fare will be the same as on the other bridges, namely, 2½ and 3 cents.

The Rockland Railroad Company, which is to operate a trolley line 41 miles long in New York and New Jersey, has applied to the Public Service Commission, Second District, for permission to issue $2,767,000 of bonds and to increase its capital stock from $100,000 to $630,000.

The New York Public-Service Commission, Second District, has given permission to the Rensselaer Falls Electric Light & Power Company to construct, maintain and operate a distribution system in the town of DeKalb in the village of DeKalb Junction, St. Lawrence County, for the purpose of furnishing electricity for light, heat and power. An order has been served on the Hallett Light & Power Company and the Riverhead Electric Light Company requiring them to immediately improve their poles, guard-arms and wires in the streets of Riverhead, Suffolk County. At Albany, on Monday, a hearing was held on the application of the Pawling Electric Light, Heat & Power Company for approval of franchises in Pawling, Dutchess County, and for authority to issue stock, will be heard; also the complaint of a committee of citizens of West Albany against the United Traction Company asking that the lines be extended across the bidge spanning the New York Central & Hudson River Railroad tracks in the village of West

Albany, and the complaint of the village of Waterford against the Troy Gas Company relative to failure to furnish gas to the village of Waterford, which supply was cut off on June 10 upon the burning of the Union Bridge.

Worcester Electric Light Company Report.

The annual return of the Worcester Electric Light Company to the Massachusetts Gas and Electric Light Commission has been filed for the year ending June 30, 1909. The company's statement shows that the total earnings for the year were $349,734.48 compared with $334,528.92 for the preceding year, a gain of slightly over 4.5 per cent. The total expenses of operation for the year just closed were $171,968.48, against $172,050.05 in 1908, which is practically the same total cost of operation in each case. The balance to profit and loss this year is $177,766. Last year it was $162,478.87. The balance is therefore about 9.4 per cent more this year than last. These figures indicate both improved business conditions and careful administration of the property, since a notably increased service was rendered by the company at about the same expense of operation in each case. The company paid 10 per cent in dividends upon its capital of $800,000 in the year just closed.

In the year ending June 30, 1909, the company generated 5,754,268 kw-hours and sold 4,879,973 kw-hours, or 85 per cent of the energy generated. There was a gain of about 354,000 kw-hours generated compared with 1908, and 349,000 more units were sold this year. The energy sales were 7.7 per cent larger in 1909 than in 1908. As the company's gross earnings were less than 5 per cent greater this year the public obtained a considerable portion of its supply at a lower relative cost turing Company's type, of a total rating of 3900 hp, and a principal source of income of the company in the year just closed was from commercial arc and incandescent lighting by meter, a gain of about $10,000 being shown here. The revenue and energy sold for the fiscal year were as follows:

WORCESTER ELECTRIC LIGHT COMPANY.

	Income, 1909	kw-hours sold, 1909
Commercial lighting contract, arc and incandescent	$14,796.89	$298,657
Lights by meter	198,197.18	2,363,574
Public street arc lights (delivered at switchboard)	77,002.00	1,301,100
Public street incandescent lights	3,631.50	
Electric power	53,915.96	916,642
Total net	$347,543.53	$4,879,973

These figures show that the average income per kw-hour sold was about 7.1 cents. The average income from commercial arc and incandescent lighting by meter was 8.4 cents, and the average revenue from electric power per unit sold was 5.85 cents. The company's power sales were about 11.6 per cent greater for 1909 than in the preceding fiscal year.

The principal expenses of the company for the year were as follows:

Cost of manufacture	$72,203.05
Purchased power (32,511 kw-hours)	1,625.55
Distribution	39,275.38
Office expenses and management	17,973.31
Miscellaneous, including taxes, insurance, legal, etc	40,891.19
Total	$171,968.48

The company had 3,122,494 ft. of cable installed in underground conduits on June 30 last, continuing to hold its position as the second central station in Massachusetts in length of underground wire in service. There are now 1550 manholes and 1983 service connections on the system. The company has installed 329,262 ft. of cement-lined and vitrified clay pipe, 293,331 ft. being of the four-duct type. There are 405 motors aggregating 1950 hp now connected to the company's power circuits, compared with 298 motors, totaling 1601 hp a year ago. The average size of each motor this year is 4.8 hp, compared with 5.4 hp last year, indicating a tendency toward the more extensive use of electric power among smaller consumers. The company installed 3¼ miles of conduit and 300,000 ft. of cable during the year. There are now about 2552 customers.

The equipment has remained unchanged, on the whole, during the year, except in the new underground construction noted and in the addition of a 500-kw Westinghouse motor-generator set which is used to supply part of the 500-volt power service. The steam generating plant now consists of 12 Stewart boilers of the horizontal, return-tubular type, rated at 250 hp each, and operating at 140 lb. steam pressure, hand-fired, with natural draft supplied by two brick stacks. The prime movers consist of four horizontal, cross-compound condensing engines of the Corliss and the American & British Manufacturing Company's type, of a total rating of 3900 hp, and a 1500-kw General Electric-Curtis turbo-alternator. There are three alternators of the direct-connected type with an aggregate rating of 2250 kw, besides the turbo-set. These units are all built for 2300-volt, 60-cycle operation. The magnetite arc system is in operation in the Worcester street-lighting service, the current being supplied through mercury-arc rectifiers and tub transformers. The company burned 8565 tons of bituminous coal during the year at an average cost of $4.59. The cost of manufacture was as follows for the fiscal year 1909:

Item.	Amount.	
Fuel	$39,426.36	or 0.69 cent per kw-hr. mfd.
Rental real estate	225.00	
Oil and waste	1,594.83	
Water	1,639.86	
Wages at station	19,570.91	or 0.34 cent per kw-hr. mfd.
Building repairs, station	2,890.98	
Steam repairs, station	4,159.43	
Electrical repairs, station	2,705.68	
	$72,203.05	or 1.25 cent per kw-hr. mfd.

The station operating force included four engineers, one electrician, five firemen and 12 station men. The increase in the company's small power business is a most gratifying sign in the enlargement of the future market for electric motor service in Worcester.

Organization of Engineering Staff of Wisconsin Commission.

An account of various general features of the work of the joint engineering staff of the Wisconsin Tax and Railroad Commissions, taken from a paper prepared by Prof. William D. Pence, engineer of the commission, was published in the issue of Jan. 14, 1909. The following additional information relates to the organization of the staff:

Directly under Professor Pence is the assistant engineer and office engineer, which position is now occupied by Mr. W. E. Miller. The organization plan provides ordinarily for a civil engineer inspector, but this office is temporarily vacant. There is a chief mechanical inspector, Prof. J. G. D. Mack. The office of chief electrical inspector is vacant temporarily and the duties are divided between two engineers, each having the title of field electrical inspector, as follows: Mr. R. W. Harris, who is responsible chiefly for electrical machinery and electric railway rolling stock, and Mr. W. F. Sloan, who has charge of valuations of electrical distribution systems, including electric lighting and power and street-railway and telephone properties. Prof. C. F. Burgess is expert on light and heat, and is also chief of two departments—gas engineering and gas and electric service inspections.

Omaha Electrical Club.

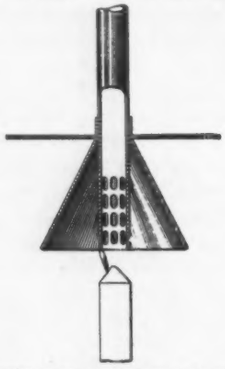
The Omaha Electrical Club dates back to 1903, when a number of electrical business men in Omaha and vicinity formed the organization for mutual assistance, as the wiremen were on strike at that time. Later the differences with the workmen were amicably adjusted and normal business conditions were resumed. The club was kept up, however, and it has been developed and broadened so that its purpose is now characterized by a wide outlook having to do with the improvement of its members. There are about 45 active members at the present time, and a great deal of good has been accomplished in creating harmony and pleasant relations among all the mem-

bers. During the winter season lectures and addresses are given by members and others.

Anyone directly connected with the electrical business is eligible to membership. The regular monthly meeting of the club is held on the second Wednesday of each month. An additional feature of exceptional interest is the weekly luncheon held at the Omaha Commercial Club every Wednesday noon. All electrical traveling men who may be in Omaha on that day are invited to attend this luncheon, and are called upon to speak, giving their views about the conditions in the electrical industry as they find them. During the summer of 1909 two outings were given by the club and were greatly enjoyed. The meetings are interesting and well attended. The present officers of the club are: President, Mr. Israel Lovett; vice-president, Mr. Benjamin McInerney; treasurer, Mr. Wilbur M. Burgess; secretary, Mr. H. P. Kerr.

Electrode for Flaming-Arc Lamps.

For the purpose of providing a chimney for the fumes from a flaming-arc lamp and affording a means for removing the slag formed upon the end of the composition electrode, Mr. S. P. Wilbur proposes to employ the arrangement illustrated herewith, for which a patent was granted to him on Aug. 17. The upper electrode is of copper constructed in the form of a tube, the inner diameter of which is less than the diameter of the other electrode. When the electrodes are brought together, in the usual manner, to start the arc the tubular electrode will

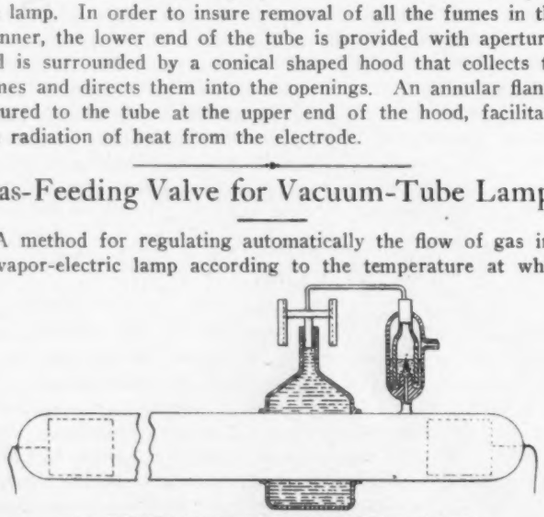


ELECTRODE FOR FLAMING-ARC LAMPS.

cut or break any insulating slag that may have been formed on the other electrode. The tube also serves as a chimney through which fumes that are given off by the arc are conveyed to the exterior of the lamp by means of the draft set up by the lamp. In order to insure removal of all the fumes in this manner, the lower end of the tube is provided with apertures, and is surrounded by a conical shaped hood that collects the fumes and directs them into the openings. An annular flange, secured to the tube at the upper end of the hood, facilitates the radiation of heat from the electrode.

Gas-Feeding Valve for Vacuum-Tube Lamps.

A method for regulating automatically the flow of gas into a vapor-electric lamp according to the temperature at which



GAS FEEDING VALVE FOR VACUUM-TUBE LAMPS.

the lamp operates forms the subject of a patent issued to Mr. D. McF. Moore on Aug. 10. The lamp is provided with a valve consisting of a pointed rod of carbon surrounded by liquid mercury; when the tip of the rod is covered by the mercury the valve is closed, while when it is exposed the gas enters the lamp through the porous carbon rod. A thermostat serves for regulating the height of the mercury by its action upon a plunger working in the chamber containing the mercury surrounding the carbon rod. The arrangement employed is shown in the accompanying illustration in which the thermostat is represented as a holder for mercury surrounding the tube lamp at such a point as to feel directly the changes in temperature due to the variation of the current traversing the gas in the tube. The adjustments are so made that when the vapor in the tube decreases in pressure the temperature rises and the thermostat admits more gas to increase the pressure within the tube.

CURRENT NEWS AND NOTES.

ELECTRIC HEADLIGHTS ON ENGINES.—The recent "electric headlight act" of the State Legislature of North Carolina, after being vigorously fought before the corporation commission, has been declared legal and will become effective. Twenty-five per cent of all engines are to be equipped annually, beginning April, 1910.

DESTRUCTION OF DAMS.—Heavy rainfalls have been so numerous in Colorado in the past several weeks, and river beds are so full that a number of irrigation dams, together with some power dams, have been washed away. Among the power plants of greater importance which have thus suffered are that of the Telluride Power Company and the Blue Water Plant near Albuquerque, N. M.

ELECTRIC STEEL WORKS IN RUSSIA.—The Slatons Works, in the Ural district, which belong to the Russian Crown, have secured the right to use the process of a German company for electric steel, the furnace in question being on the induction principle. The electric plant will be supplied by the Siemens-Halske Company. The Slatons Works intend to market directly the produce of their electric steel works.

LARGE NORWEGIAN WATER-POWER STATION.—A company has been formed, under the name of the Lysefjord Company, for the purpose of exploiting the Aardals and Lyse Rivers and disposing of the power to a foreign company. It is proposed to lead the water from the Nilsebu through a tunnel some 9300 ft. long to Kloggeli, where it passes into the Stalsaa River which opens into the Strandvand Lake. The Lyngvand is to be connected with the Strandvand through a tunnel some 6700 ft. long. This junction having been effected and the aggregate of the water now forming one stream, the latter will be taken, through several smaller tunnels and lakes, from the southwestern end of the Strandvand Lake to the mountain edge above Lysefjord at Maagelien, where there will be a fall of some 2000 ft., with a calculated effective capacity of 100,000 hp.

MANUFACTURE OF CALCIUM CARBIDE IN EUROPE.—Existing European carbide manufactories have an aggregate of 367,000 hp, while the present annual requirements are estimated at 192,000 tons. Of the total power used in this industry 70,000 hp are employed in Sweden and Norway, where the production only amounts to some 35,000 tons annually. The factories in question work under the most favorable conditions, and the cost of manufacture only amounts to $11.10 per ton. In France this industry takes 48,000 hp, with an output during 1908 of 26,000 tons, while the capacity of the existing plant amounts to 50,000 tons per annum, principally produced in the Alps of Savoy; the industry is protected by a duty of $12 per ton. Switzerland, with an aggregate of 60,000 hp, produces 30,000 tons annually, which go to Germany. Italy's production for 1907 amounted to 30,526 tons, the power at the service of the industry being 46,000 hp. Austria produces some 20,000 tons of carbide per annum, with an aggregate power amounting to 35,000 hp. Germany consumes about 40,000 tons annually.

ELECTRIC SIGNS IN LOUISVILLE.—Within a year the electric signs in Louisville have increased from 64 to 367, the sign lamps now having an aggregate candle-power of 80,000.

HOLYOKE MUNICIPAL STATION.—The output of the Holyoke municipal electric lighting plant was 66 per cent greater in August than in the same month of last year. The total output for last month was 628,460 kw-hours.

FRANCO-SPANISH TELEPHONE.—It is reported that negotiations for through telephonic communication between Madrid and Paris are well advanced, while it has been definitely decided to provide telephone lines between Madrid and Bordeaux.

WIRELESS TO SOUTH POLE.—The plans of the proposed British Antarctic Expedition provide for wireless equipments which will enable wireless messages to be sent to New Zealand from aboard ship and from stations at bases of supplies.

GREAT BRITAIN SECURES MARCONI HOME STATIONS.—The Postmaster-General of Great Britain has concluded an agreement with the Marconi Company for the transference to the Government of its wireless telegraph stations in the United Kingdom. The arrangement is purely insular, and does not embrace transatlantic communication.

DALLAS ELECTRICAL ORDINANCE.—The city of Dallas, Tex., has recently passed an electrical ordinance which it claims to be the best in the country. The ordinance requires bonds of every person who handles electrical appliances in any manner, including contractors and the men employed by them, window decorators, stage employees, etc. Before a permit for an installation will be given plans must be submitted showing every connection, and when finished the work will be inspected to see that it corresponds as to number of lights to the plans submitted. All secondaries are required to be grounded.

MEETING OF KANSAS ELECTRIC ASSOCIATION.—The annual meeting of the Kansas Gas, Water, Electric Light & Steel Railway will be held at Wichita, Kan., on Sept. 23 and 24. Of the eight papers to be presented only one deals with an exclusively railway subject. The others are entitled: "Scientific Illumination," by Mr. F. B. Galloway; "Sizes of Single-Phase Motors," by Mr. H. W. Briscoe; "Notes on Transformers," by Mr. B. F. Eyer; "Duties and Liabilities of Electric Companies," by Mr. J. C. Nicholson; "Series Tungsten Lamps for Street Lighting," by Mr. W. E. Sweezey; "Transformers," by Mr. J. L. Buchanan, and "Tungsten Lamps," by Mr. Benson.

SELF-EXCITING ALTERNATOR.—A patent for a self-exciting alternator, issued to Mr. William Stanley on Sept. 7, covers the machine described at length in an article by Mr. G. Faccioli which appeared in our issue for Sept. 15, 1906. The alternator is constructed so as to resemble an induction motor with a coil-wound secondary, the rotor being equipped with a commutator. During operation the rotor cuts across a revolving field which cuts the stator conductors. The frequency bears to the speed of rotation such a relation that the e.m.f. generated by speed action in the rotor is equal to the e.m.f. produced by transformer action in the stator. The frequency, therefore, depends upon the ratio of stator and rotor turns as well as upon the rotative speed.

N. E. L. A. SECTIONS.—On Sept. 9, at Schenectady, under the chairmanship of Mr. C. D. Haskins, a meeting of some 300 or 400 employees of the General Electric Company and of representatives from 22 central-station companies in the vicinity was held to consider the advisability of forming a company section of the National Electric Light Association, and possibly a geographical section. Great interest was shown in the matter. The gathering was addressed on behalf of the association by President Frueauff, Past-President Doherty, Mr. H. H. Scott, the chairman of the association membership committee, and Mr. T. C. Martin. At the close of the meeting a committee named by Mr. Haskins took up at once the question, and will report at an early date. There is every promise that Schenectady will support a large and active Class D company section. Similar movements are on foot at other electrical manufacturing centers.

NAVAL ACADEMY POST-GRADUATE ELECTRICAL COURSE.—A post-graduate electrical course will be opened Oct. 1 at the U. S. Naval Academy, Annapolis, Md., 10 officers having been ordered to report then for instruction. The course will be under the direction of Lieut.-Com. Milton E. Reed, of the navy, the head of the Marine Engineering School of the Navy. He will also have charge of the special course in naval engineering and marine engine design, which will also begin at the academy in October. The consolidation of the courses of steam engineering and electricity has been authorized because it is realized that officers who are detailed to take the course in naval engineering will also need the course in electricity. The officers designated to take the course in electricity will also be afforded periods of observations at plants and may attend technical schools where there are special courses in electricity. The four officers now on duty at the works of the General Electric Company, at Schenectady, N. Y., will form the first class in this post-graduate course.

DELINQUENCIES OF AMERICAN EXPORTERS.—U. S. Special Agent A. B. Butman, in a report on trade with Latin-American countries, says that the annual aggregate loss to the importer through careless packing is considerable, and reacts as a detriment to further development of American trade. Over against delinquencies in packing and short-time credits allowed by shippers from the United States, the Latin-American buyer weighs the satisfactory method of packing and the long period extended for credit by European competitors. Business communications should, he said, be courteously, not curtly, written. When dealing with foreign people, their customs must be observed. A case in point is mentioned: An importer in the city of Panama remitted a check of several hundred dollars, covering the amount of his bill, to a New York house. Accompanying the check was a most courteously written letter. This letter, when received in New York, was stamped "paid" and returned as a receipt to the sender, without further acknowledgment. The New York house in question is quite unlikely to receive further orders from that South American firm.

PUBLIC SERVICE AT THE STATE FAIR.—The Public Service Commission of the First District has placed in the State Fair, which is now being held at Syracuse, a very complete and instructive exhibit. By a set of charts and statistics the magnitude of the transportation, electric and gas business of Greater New York is set forth. There is, among other things, a chart showing the hourly ticket sales on the steam and elevated lines, ferries and bridges over the East River, and a large map of New York City showing all of the street railways within the city limits. Appliances used in the fender tests which took place last year in Schenectady and Pittsburgh are also shown, with figures and statistics. Among the startling figures that are furnished in this exhibit is the fact that in New York last year there was 1,323,326,655 fare passengers carried upon the transportation lines. This is 17.8 per cent of all the fare passengers carried in the United States. These figures are particularly significant when it is considered that the population of New York City is only about 5 per cent of the entire population of the United States, and with little more than half the population, New York carried almost twice as many passengers as London. Photographs and full descriptions of the commission's electric laboratory also form part of the exhibit.

ALABAMA LIGHT AND TRACTION ASSOCIATION.—The Alabama Light and Traction Association will hold its annual convention at Birmingham, Nov. 15 and 16. Mr. Lloyd Lyon, of Mobile, is secretary.

JAPANESE WIRELESS TELEPHONE.—The principal ships of the Japanese navy are being equipped with Professor Missuno's wireless telephone apparatus. These vessels are already provided with wireless telegraph equipments.

JAPANESE ELECTRICAL ENTERPRISES.—Out of 817 manufacturing industries in Japan 198 use electric power. The rating of electricity works now in service is 170,000 kw, while permits have been issued for an additional 210,000 kw.

FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The next meeting of the French Association for the Advancement of Science will be held at Toulouse in 1910. The president is Dr. C. M. Gariel, professor of medical physics at Paris.

NEW YORK ELECTRICAL WORKERS BUSY.—The Electrical Workers' Union of New York has announced that the electrical illuminations for the Hudson-Fulton celebration require so many men that there is not a competent electrical worker in the city who is idle.

RADIUM IN CALIFORNIA AND COLORADO.—Reports from California state that valuable deposits of radium-bearing pitchblend have been discovered on the McCloud River. It is also reported that pitchblend has been discovered in the Cripple Creek district of Colorado.

ELECTRIC LOCOMOTIVES FOR JAPAN.—The *Japan Chronicle* has announced that the Middle District Railway Office has decided to dispense with steam engines on the Hachioji-Kafu line, and to use electric locomotives. Fifteen motor-cars have been ordered from the Osaka Railway Carriage Manufacturing Company.

BRITISH DAYLIGHT-SAVING SCHEME FAILS.—The select committee of the British Parliament appointed to consider the daylight-saving bill has issued a report which recommends that the bill be dropped because of grave doubts whether its objects could be attained without subjecting some important interests to serious inconvenience.

THE EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.—On account of the Hudson-Fulton celebration, it has been found necessary to change the date of the annual meeting of the Empire State Gas and Electric Association from Oct. 6 and 7 to Nov. 17 and 18. Mr. Charles H. B. Chapin, 29 West Thirty-ninth Street, New York, is secretary.

TESTING MATERIALS CONGRESS.—The International Congress on Testing Materials, which has been in session at Copenhagen, Denmark, will hold its next meeting in New York in 1912. Mr. Charles B. Dudley, of Altoona, Pa., has been elected president of the International Association. Mr. Dudley is chemist for the Pennsylvania Railroad Company, and is a member of the American Institute of Electrical Engineers.

ENGLAND-SOUTH AFRICA WIRELESS.—Experiments are being conducted at Durban, Natal, with a view to installing a direct aerographic service between South Africa and England. It is proposed to try kites flying at a height of 1000 ft. to collect the Hertzian waves. It is anticipated that the Government of South Africa will eventually grant a subsidy sufficient to enable a charge of 2 cents a word. Initially the rate will be 24 cents.

LARGE SOUTH AFRICAN HYDRO-ELECTRIC DEVELOPMENT.—The United States consul reports that three large European banks will supply funds to the Pretoria Power Company for a great hydro-electric plant on the Crocodile River, South Africa. For the initial works, which will generate 20,000 hp to 25,000 hp, $3,469,875 will be required, with a further expenditure of $1,250,000 for a nitrogen fixation plant to which the energy is to be supplied. Nitrate of lime and nitric acid will, it is stated, be the final product.

INCANDESCENT LAMPS.—In the Digest in our issue for Sept. 2, on page 564, there appeared an abstract of an article by Mr. A. C. Jolley in which use was made of a radical sign in expressing the law of the variation of the candle-power with the voltage of incandescent lamps. In each of the equations there shown the symbol V should have been employed in place of the radical sign. Thus the first equation should read $cp = 3.2V^{5.4} \times 10^{-10}$, which shows the candle-power of a 16-cp, 100-volt carbon lamp when operated at electromotive forces not exceeding 85 volts.

ELECTRIC TRACTION DEVELOPMENT IN BRITISH COLUMBIA.—It is claimed that there are few electric railway systems on this continent that have spent so much on development as the British Columbia Electric Company, which operates in western British Columbia. Since 1900 this company has expended approximately $6,000,000, including $2,000,000 for power development at Lake Buntzen. The agreement between the company and the city of Vancouver was entered into during 1900, and the plans of the company already accepted provide for the expenditure of a greater sum during the immediate future.

PROPOSED CHICAGO SUBWAY.—Mr. George W. Jackson, president of George W. Jackson, Inc., has sent a formal communication to the city clerk of Chicago offering to submit to the City Council plans for an $80,000,000 subway system for Chicago. The letter embodying this proposition was submitted to the City Council on Sept. 8 and was referred to the local transportation committee. Mr. Jackson says that he is ready at any time to discuss with the aldermen the details of the project. He assets that his company is prepared to start work at once on the construction of 12 miles of tunnels in the district bounded by Chicago Avenue on the north, Michigan Avenue on the east, Twenty-second Street on the south and Halsted Street on the west. In addition the company declares that it is prepared to submit figures for the construction of a much more extensive system serving a large portion of the city's area and including 80 miles of subway.

WIRELESS DISEASE.—According to M. P. Bellile, a French naval surgeon on board the *Descartes*, which has been engaged in the campaign in Morocco, the members of the ship's company who were employed in wireless telegraph duty developed various affections in consequence of the action of the Hertzian waves. Most commonly the telegraphists complained of their eyes, a slight conjunctivitis similar to that occurring among those who work with arc lamps being found. Although this of itself was not generally serious, in one case where the attacks recurred again and again, keratitis was produced which resulted in a leukoma of the right cornea and consequent impairment of vision. In order to protect the eyes from the ultra-violet rays of electric emanation, it was recommended that yellow or orange glasses should be worn. Not only were the eyes of the operators affected, but two cases of eczema—one of the wrist and one of the eyelid, both very difficult to cure—were seen. One of the officials who had been employed for several years in wireless telegraphy suffered from painful palpitation of the heart, which came on after working for any length of time at the instruments for sending messages. This man was quite free from any organic lesion of the heart. M. Bellile is disposed to think that a good many of the cases of nervousness and neurasthenia, which seem now to be getting rather common among naval men, may be due to the work which is being done in wireless telegraphy.

Electrical Equipment of the Great Western Power Company.

THE hydro-electric development of the Great Western Power Company, at Big Bend, on the Feather River, was described in the Aug. 26 issue. The project is on a grander scale than any of the numerous transmission plants having lines terminating on the Pacific coast, and the equipment throughout represents the limit thus far reached as to size. Preliminary surveys of the watersheds were made with as much care and in as minute detail as would be made by a city of 1,000,000 inhabitants seeking to safeguard its water supply for years to come. When completed, the station will

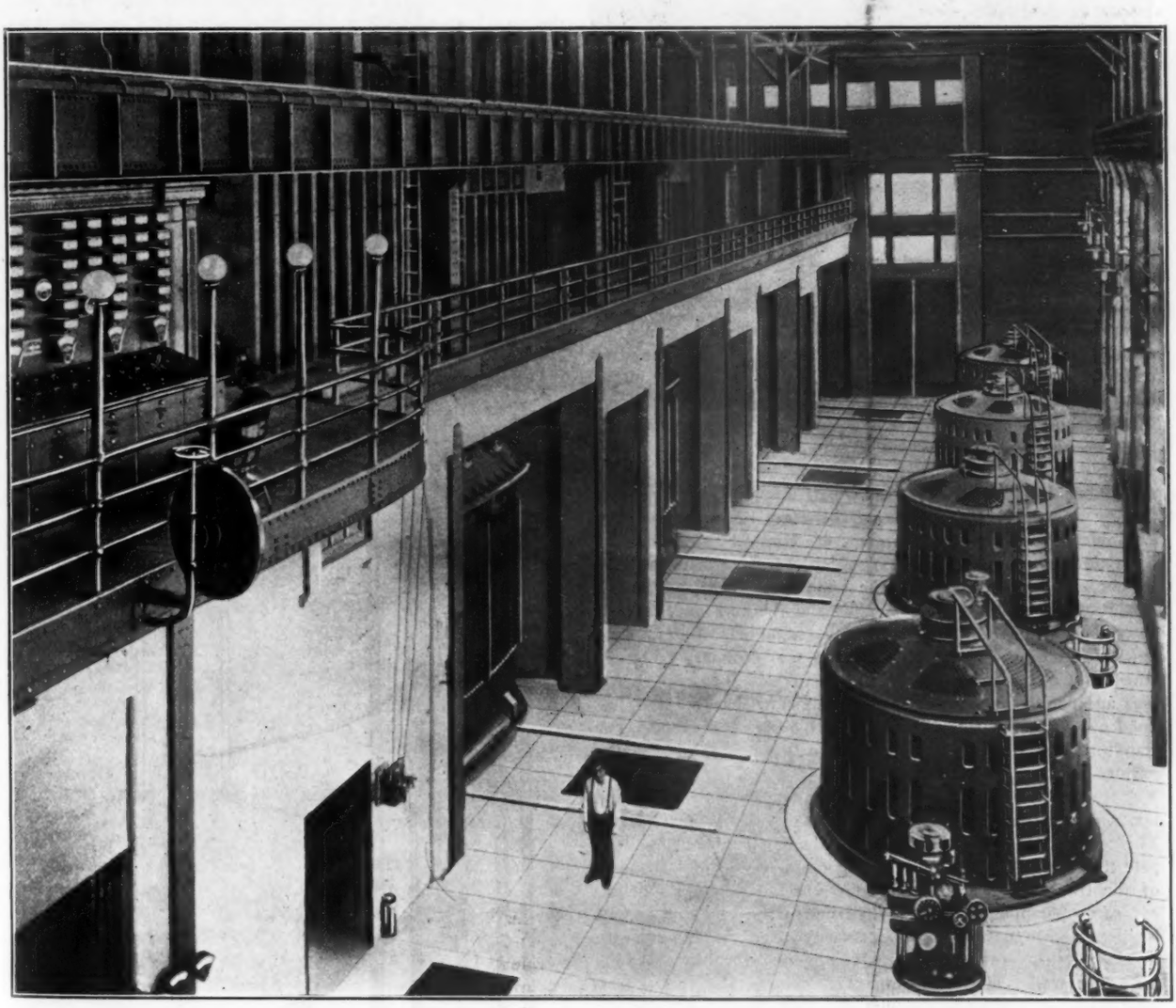


FIG. I.—GENERAL INTERIOR VIEW OF THE GREAT WESTERN POWER COMPANY'S HYDRO-ELECTRIC STATION.

be the largest in the West and one of the largest in the world. A detailed description of the water turbines, which are the highest powered wheels in existence, was published in the previous article and details of the electrical equipment are given below:

The main generators, of which there are four at present in operation, are three-phase, revolving-field machines wound for 11,000 volts, 60 cycles, and have a rating of 10,000 kw each. The normal speed is 400 r.p.m. These alternators are of the vertical-shaft type, each supplied with two guide bearings, one immediately above and the other immediately below the generator. The shaft has a forged-on flange for coupling to the water-wheels. The details of the rotor were worked out with unusual care; the method of dovetailing the pole piece to the rotor rim was invented for this particular machine. The copper of the field coils is supported at the two ends against centrifugal forces by means of heavy steel disks, so arranged as to allow of circulation of large quantities of air over all the heated parts of the rotor and stator without excessive windage losses. The field copper along the sides of the poles is supported by means of two gun-metal brackets. A hydraulic brake is applied to a ring on the base of the field structure to hold the generator in case of leakage in the water-wheel and also to bring it to a standstill quickly when necessary.

A double speed test of the generators was made at the factory. The peripheral velocity at normal speed, 400 r.p.m., is 11,500 ft. per minute, hence at double speed it is 23,000, or somewhat over four miles per minute. Probably no high-speed water-wheel generator has ever been subjected to so severe a mechanical test. Complete tests of the machine showed efficiencies somewhat in excess of the guarantee, as follows:

	Guaranteed.	Actual.
Full load	96.9 per cent	97.1 per cent
Three-quarters load	96.0 per cent	96.4 per cent
One-half load	94.5 per cent	95.0 per cent

The temperature rise was within the 40 deg. C. limit.

The transformers are of the three-phase, water-cooled type, and are the largest ever built. They have a normal rating of 10,000 kw at 100,000 volts delta on the high-tension side and 11,000 volts delta on the low-tension side at a frequency of 60 cycles per second. The transformer consists of a set of flat

primary and secondary coils, placed vertically and surrounded by a built-up steel core. The coils are so placed as to admit of a free circulation of oil between them, which acts not only as

FIG. 2.—REVOLVING FIELD STRUCTURE OF 10,000-KW ALTERNATOR.

an insulator, but as a cooling medium, by conveying the heat from the interior portions of the transformer to the tank and cooling coil by natural circulation. The primary and secondary windings are subdivided into several coils, each built up of flat conductors wound with one turn per layer so as to form thin, high coils which present a large radiating surface to the oil.

Placed between adjacent primary and secondary coils is a continuous insulating diaphragm which is rigidly held in position by spacing channels covering the edges of the coils. The assembled coils, except at the ends, are completely enclosed by continuous sheets of insulation which interpose a substantial barrier at all points between the winding and the core. The insulation between the primary coils and the core and between the primary and secondary coils will stand a test of 200,000 volts, alternating current, and between the secondary coils and core a test of 24,000 volts, alternating current. The core, windings and cooling coil are completely immersed in a specially refined oil, approximately 9000 gal. of which is required for each transformer. A valve for drawing off the oil is located in the base of the tank.

A coil of pipe for water circulation is placed in the oil in the upper part of the tank and surrounds the end of the winding. The combined surface of the coil and tank is sufficient to dissipate the heat generated and thus maintain the oil and all parts of the transformer at a low temperature. The water-cooling coil of copper pipe absorbs that portion of the heat that cannot be dissipated by natural radiation from the tank, and is made to fit closely the transformer, thus minimizing the oil and floor space required. The transformer is enclosed in a boiler-iron tank, which is secured to the cast-iron base by a joint made oil-tight by heavy riveting and calking. The tank has been constructed with an arched cast-iron cover, from which the transformer is suspended.

The primary and secondary leads, consisting of insulated cables, are brought through porcelain bushings in the cover. For the primary terminals sectional oil-filled bushings are used. They are made up of a number of small annular sections assembled with press-board rings between them, which extend outward several inches from the bushings proper, thus greatly increasing the leakage surface. A heavy metal rod, which serves as a terminal lead, passes through the center of the bushing, binding together tightly the several sections and extending rings.

The oil space is divided into a number of sections by press-board cylinders which are made concentric with the lead. Bushings can be kept filled up to the proper level by the aid of a sight gage placed near the top. An eyebolt and hook are furnished with each bushing and are arranged to be screwed into the top of the terminal for convenience when handling the bushings. The completed bushings are so designed that they may be readily removed from the transformers.

The transformer has a tap in the high-tension winding for 60,000 volts with rating reduced in proportion. There are taps in the secondary winding of approximately 5 per cent and 10 per cent above and below 11,000 volts, with corresponding proportional changes in the transformer rating. The efficiency of the transformer when at full load is approximately 98.5 per cent.

For the purpose of exhausting the 1,300,000 cu. in. of air from the transformers prior to filling them with oil, a vacuum pump, rated at 50,000 cu. in. of air per minute, is installed. This is driven by a 250-volt motor through countershafting. Each transformer is mounted on flanged wheels, the bearings for which are lined with a bronze alloy to prevent rusting. By this means the transformers can be wheeled from their compartments and handled by the 50-ton crane with which the generator-room is equipped. In wheeling the transformers to and from their cells, block and tackle are employed, the ropes being fastened at one end to the transformer and at the other

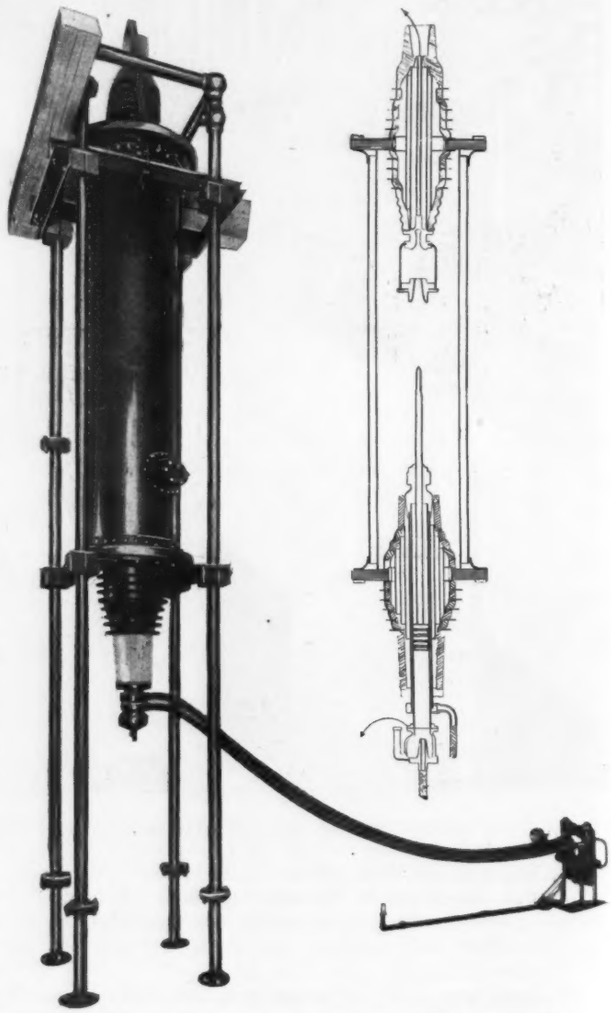


FIG. 3.—DETAILS OF PNEUMATICALLY OPERATED SWITCH.

end to the overhead crane. When pulled into position by this means, the parts of the transformer are handled directly by the crane.

The main switchboard is of the benchboard type and follows standard practice in its design. Below it on the generator floor

is an auxiliary switchboard from which are controlled all of the lamps in the station and all of the auxiliary motor-driven apparatus and penstock valves. The motors are 250-volt direct-

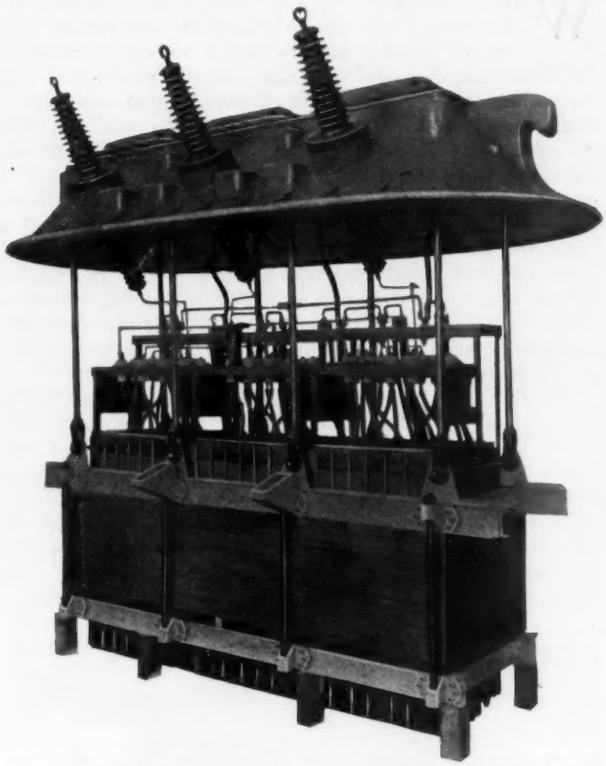


FIG. 4.—THREE-PHASE, 10,000-KW TRANSFORMER WITH COOLING COILS REMOVED.

current machines, and the lighting circuits are supplied from three single-phase transformers having a secondary potential of 110-220 volts. The main board overlooks the operating-room floor, and from it are controlled the motor-operated rheostats for the fields of the alternators, the motors on the

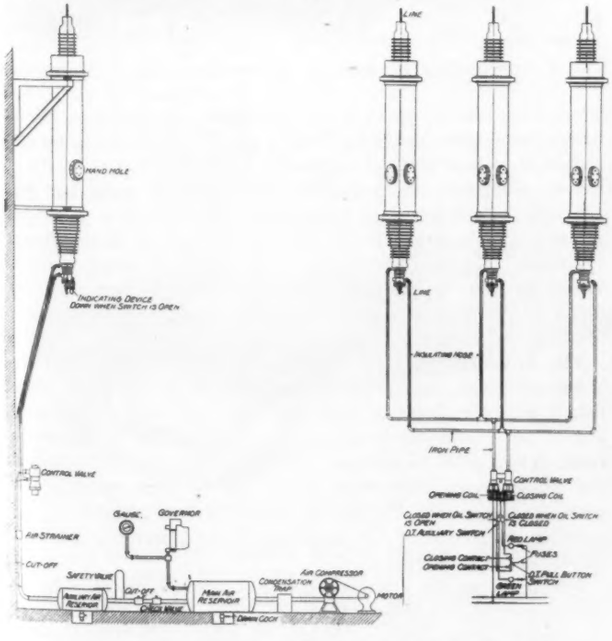


FIG. 5.—ARRANGEMENT OF 100,000-VOLT SWITCHES.

water-wheel governors, the 11,000-volt motor-operated oil switches, the 100,000-volt pneumatically operated switches, disconnecting switches on the main and auxiliary 11,000-volt buses, disconnecting switches on the 100,000-volt buses, etc. Series transformers are connected on the outgoing high-tension leads so that both the high-tension and low-tension currents

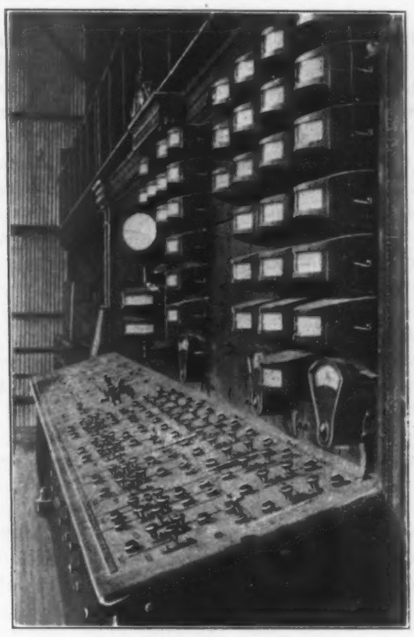


FIG. 6.—VIEW OF MAIN SWITCHBOARD.

may be measured, and also in order that the current in each line as it leaves the station may be ascertained. The exciter buses are electrically operated. The high-tension pneumatically operated switches are of special interest, being the first of their type installed in power-plant operation and a brief description of their make-up is given below.

The 100,000-volt oil switches consist of three single-pole elements, pneumatically operated and electrically controlled. The

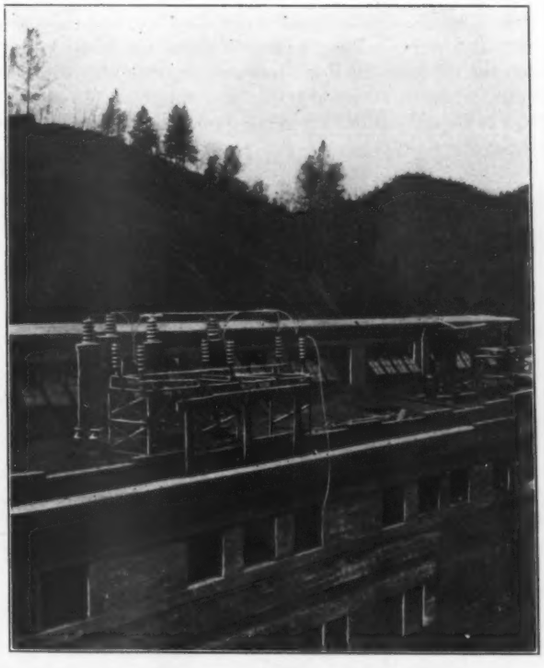


FIG. 7.—ALUMINUM CELL LIGHTNING-ARRESTERS ON ROOF OF STATION.

switches are opened and closed by means of single-pole, double-throw, hand-operated controlling switches, located on the controlling benchboards. The red and green indicating lamps,

which are a part of the controlling switches, are so arranged that when the oil switch is closed the red light shows up and indicates that the line is alive and dangerous. When the switch is open the green light indicates that the line is dead and not in use.

Aside from this indicating device, there is a mechanical indicator located at the bottom of the lower insulator, which shows whether the switch is open or closed, this insulator being operated by the piston. Each pole of the oil switch consists of a steel tube with an insulator at each end. The upper insulator contains the contacts, and the lower contains a piston which operates the contact rod, the piston being actuated by compressed air, as shown by Fig. 5. The contact consists of four sections of extruded metal held in position by a retaining nut and containing special tension springs to insure good contact. On opening, the arc is ruptured in a steel explosion chamber.

The switches are operated at 80 lb. pressure, controlled through valves electrically operated on the 250-volt direct-current circuit. The valve is located directly below the switch and is connected to the switch by means of a treated tube, giving sufficient insulation between the high-tension and low-tension parts. The valves are so designed that they may be tripped through switchboard relays. Each switch is supplied with a 3-cu. ft. capacity air tank, which allows of opening or closing the switch independently of the storage tanks. Check valves and air strainers are used between the storage and small tanks. The switches are arranged in a vertical position and supported under the upper flange of the tube and braced just above the lower flange, the outer casing being grounded. Special built-up insulators are used. The outside shell is made of heavy composition rings and washers and is filled with a compound of high insulating value.

The outgoing lines are protected by aluminum cell arresters on the roof of the station. Suspension-type insulators on steel towers support duplicate No. 3-0 copper lines running for the most part over a private right-of-way to Oakland. Running along the top of the towers is a ⅜-in. steel ground wire. The towers, which are about 71 ft. high above ground, are spaced 750 ft. apart, and transpositions are made every three and one-half miles.

There are approximately 1200 ordinary Milliken towers, with 13 special towers, varying in height from 150 ft. to 300 ft., in use on the 165 miles of line. In many sections very soft ground prevails, while in others marshes and water are crossed. The towers in these localities are erected on piles and concrete work. This is especially true of the section between Antioch and Sacramento, where the line runs across a number of small islands. Here concrete foundations are used and special towers. At Antioch there are two 3000-ft. spans from towers 292 ft. high.

From Oakland to Antioch the country is hilly, while from Antioch to Oroville the line follows the Sacramento Valley in perfectly flat country subject to floods. From Oroville to the power station the line runs along the foothills of the mountain. The foundations of the towers in many places have been strengthened by means of concrete since their erection. The line at present is being operated at 60,000 volts pending the completion of the substations.

The terminal station at Oakland will contain three 10,000-kw transformers, two of which are at present installed. There are two incoming and six outgoing lines at the station, with tie lines between it and the steam-auxiliary station at Oakland, which will be described in a subsequent issue. Messrs. Viele, Blackwell & Buck, of New York, are the engineers for the entire project. The electrical equipment was built by the General Electric Company. The officers are as follows: President, Mr. Edwin Hawley, New York; vice-president and general manager, Mr. H. H. Sinclair, San Francisco; secretary, Mr. H. P. Wilson, New York; treasurer, Mr. F. M. Tompkins, New York; auditor, Mr. C. E. Mynard, San Francisco, and purchasing agent, Mr. H. P. Pitts, San Francisco. The offices of the Great Western Power Company are in New York and San Francisco.

High-Voltage Generators.

By Frank Koester.

WHILE American engineers have been discussing the advantages and disadvantages of high-voltage generators feeding directly into a system, it remained for Continental engineers to design, construct and operate such machines. Of the several high-voltage generator installations which have been in operation for many years, probably the most prominent one is that recently erected at Manojlovac, Dalmatia. That high-voltage generators are practicable is proved by this 30,000-volt plant, feeding a 21-mile aerial transmission line, built for the same company, which has had a 15,000-volt generator plant in operation since 1903, feeding directly a six-mile aerial transmission system. Both transmission systems run over a section of mountainous country, subject to violent thunder storms and other atmospheric electrical discharges, the energy being utilized in the manufacture of calcium carbide.

The 15,000-volt plant is located at Jaruga, on the Kerka River, some six miles above Sebenico, Dalmatia, where the carbide works are situated. The equipment consists of two 3500-hp Francis turbines, running at 350 r.p.m., each being directly connected to a 42-cycle, 15,000-volt, two-phase generator, having a 3000-kva output, with a power factor of 80. The new plant is installed at Kerka Falls, and is equipped with four 6000-hp Francis turbines, each of which is directly connected to a 42-cycle, 30,000-volt, three-phase generator, making

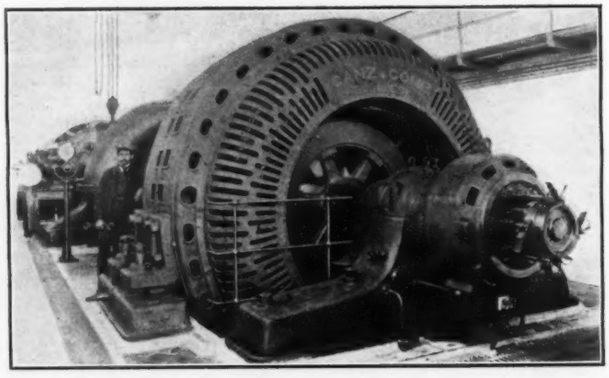


FIG. 1.—30,000-VOLT GENERATOR, MANOJLOVAC PLANT, DALMATIA.

420 r.p.m.; the output of each generator, at a power factor of 80, being 5200 kva. At this rating the efficiency is 94 per cent, and at half load, 91 per cent. When the load is suddenly thrown off from full to no load, with constant speed and excitation, the voltage rises 18 per cent. The machine is wound to withstand a short circuit for two minutes, with maximum excitation. The generators for both plants, designed and installed by Ganz & Company, Budapest, who also furnished the turbines, have many novel features; some details of the Manojlovac generator are given below.

The armature frame is split perpendicularly, forming two V-shaped rings, which again are split in halves, and when bolted together form a complete ring. As will be seen in Fig. 1, the frame has detachable feet; in the pit the armature rests on two pairs of rollers, so that after the feet are unbolted the whole frame rests upon these rollers, thus enabling the whole to be revolved. This is done for the purpose of inspecting and repairing the windings in the lower half without removing the revolving field.

Fig. 2 shows the armature coils. They are machine form-wound and of five different shapes. The copper conductor is rectangular in section and wound on edge. The convolutions of each coil give a winding of 26 conductors per slot per phase. The insulation of the coils is chiefly micanite put on in layers and held in place by insulating tape. The ends of the winding of each coil terminate in brass lugs and the coils of each phase are connected together by insulated copper cable.

The revolving field structure has 12 poles, the cores and pole cap being cast in one piece, dovetailed into a cast-steel ring, which is shrunk upon a cast-iron spider wheel. To insure additional security, each core is held by a conical bolt. The field winding consists of copper strip wound on edge; the layers are separated by paper sheets, and the whole is surrounded by a paper casing formed to suit the coils. The spider wheel is held in place by two keepers forced in by hydraulic pressure of 250 tons. The whole revolving field structure, with its shaft, not including that of the turbine, weighs 26 tons.

Another novel feature in connection with this type of generator is the exciter unit, which is mounted on the overhang of the shaft. Contrary to the usual practice, the collector rings are placed on the end of the shaft, adjoining the commutator of the exciter, so that, by extending the brush-holder arms of the latter, the copper brushes for the slip rings can be carried on them. Only one of the collector rings is insulated. The shaft is drilled up to the spider of the revolving field structure; through the hole of the shaft a flexible cable passes to the field coils. The return circuit for the exciter current is through the shaft itself. The generator shaft is rigidly coupled to that of the turbine, on each side of which is a bearing cast to a common bed plate. The bearings are 10⅝ in. in diameter and 37½ in. long. They are ball shaped, white metal lined and water cooled.

All the generators operate in parallel; to provide for regulation, the switchboard is equipped with an automatic device which opens the field circuit of all exciters in case of excess or diminution of generator voltage, or in case of current overload. This is done with the assistance of the automatic turbine regulators, which cut off the supply of the turbines. This regulator operates when the speed varies 10 per cent of normal, and requires three seconds to cut off the water supply from full to closed gate. As the load is a very steady one, this answers all practical purposes; the regulator comes into service practically only when the unit runs away.

Having no transformers, which are excellent protecting devices for the generator against atmospheric discharges to which the transmission system is exposed, the station is nevertheless well equipped with combinations of lightning arresters. There are two groups, one for busbars and the other for lines. Each phase of the bus is provided with an oil-submerged condenser, a horn gap provided with auxiliary gap and a multiple gas arrester, shunted by an oil-submerged resistance. Each phase of the outgoing lines is protected by a choke coil with capacity cylinder, a horn gap with auxiliary gap shunted by graphite resistance rods, a multiple-gap arrester with shunt resistance and a water-flow grounder. At the substation, with the exception of the busbar protection and water-flow grounders, the 21-mile transmission system has the same protection as when it leaves the power house.

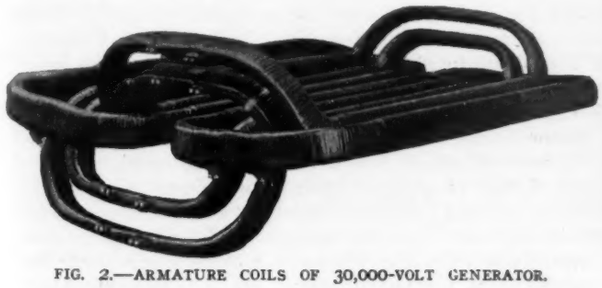


FIG. 2.—ARMATURE COILS OF 30,000-VOLT GENERATOR.

The Manojlovac plant has been in continuous operation for nearly two years, and there have been no interruptions due to atmospheric discharges. The claim of some engineers that high-voltage generators are impracticable seems to have no basis.

Another high-voltage generator plant is that of the Valtellina Railroad, located at Ponte de Desco. Here are installed three 2000-hp Ganz-Francis turbines, directly connected to 15-cycle, 20,000-volt, three-phase Schuckert generators. With a power factor of 70 the output of each, at 250 r.p.m., is 1050 kw and with normal load the temperature rise does not exceed 45 deg. C. With constant speed, and with a sudden change from no load to full load, the voltage drops 15 per cent; a sudden dropping of the load causes the voltage to rise 10 per cent. The generators can withstand a short circuit for two minutes, and for two hours a voltage of 30,000. In case the turbine regulator should fail to work, an automatic switch is provided which cuts in resistance in the generator field circuit, reducing the exciting current and thus the generator pressure.

FIG. 3.—CROSS-SECTION OF ARMATURE COILS OF 30,000-VOLT GENERATOR.

The advantages of high-voltage generator plants are: Lower first cost; low operating expense; simplicity in wiring. With the employment of high-voltage generators, transformers and their attendant troubles are eliminated. A 30,000-volt generator is, of course, more expensive than a 6000-volt or other low-voltage generator. However, taking into consideration the step-up transformers necessary with low-voltage generators, the cost of the high-voltage generator is lower. The power house is also smaller and therefore less expensive. The simplicity in the station wiring is at once evident; there is no low-tension bus system with switches, transformers and measuring instruments, therefore no special low-tension compartments are necessary. However, better and more expensive instrument transformers are required. There being no step-up transformers to look after when generators are put into service, the operating performance of the station is simplified. When generators are to be run in parallel and thrown on the line, it is only necessary to bring the incoming machines to synchronism and connect it to the bus. The absence of transformers relieves the system of surges when connecting unloaded transformers on the buses.

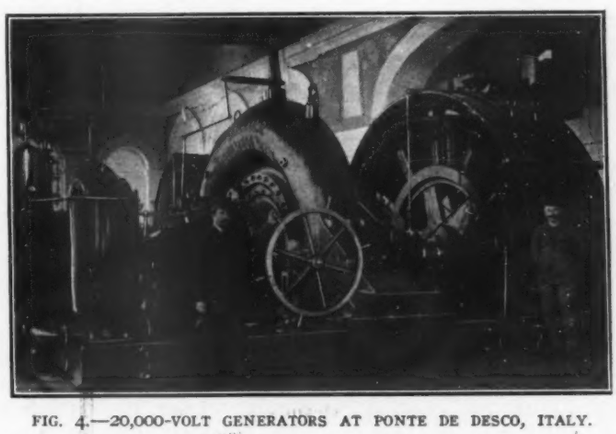


FIG. 4.—20,000-VOLT GENERATORS AT PONTE DE DESCO, ITALY.

The fear expressed by some engineers concerning the unreliability of operating high-voltage generators is practically without foundation; to entertain such fears would seem to indicate a belief that expensive high-tension transformers are the only reliable protecting devices for generators against lightning. Fortunately, other means of protection against lightning have been devised, such as those outlined.

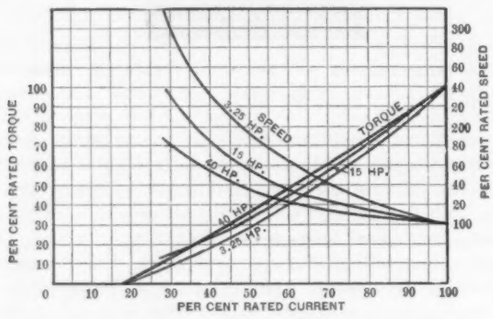
Speed-Torque Characteristics of Series Motors.

By Frank F. Seaman.

The general characteristics of the series crane motor are well known through the performance curves issued by the various manufacturing companies, but relative speed increase and torque decrease, with decreasing current, are not always stated in convenient form. The accompanying curves show, in a general way, the characteristics of a good line of series crane motor in this respect.

The magnetic circuit of a crane motor, as is well known, should approach saturation only at its rated load so as to permit of the maximum speed increase at less than full load on the crane.

By referring to the curves it will be seen that with 40 per cent of the rated current a speed increase of from 50 to 130



AMPERE-SPEED AND AMPERE-TORQUE CURVES.

per cent will result; the former for motors of from 40 hp to 50 hp, say, and the latter for motors of from 2 hp to 3 hp. The middle curve shows what may be expected of motors between these two ratings.

The curves here presented are closely true only for the motors from whose performance curves they were derived, but they are characteristic of any well-designed line of crane motor.

Characteristics of the "Spinner" Motor.

By Selby Haar.

In the Digest of a recent number of the *Electrical World* a description was given of a multi-speed induction motor which was called a "spinner" motor. The design illustrated was of a three-speed motor, the different speeds being obtained by a combination of electrical and mechanical devices.

It will be remembered that the motor consists of three parts —stator, spinner and rotor—the spinner carrying the secondary corresponding to the stator and the primary corresponding to the rotor.

It is easy to perceive how the high speed results from the connections described, because the internal magnetic field on the spinner has an absolute angular velocity in space, which is the sum of that due to the polar winding on the spinner and the actual velocity of the spinner. Thus the synchronous speed of the rotor is the sum of the synchronous speeds of the two elements.

It is not so simple, however, to devise an arrangement which will give the low speed, and, as a matter of fact, there is only one which is entirely operative. The following course of reasoning will develop the basis for this statement.

Assume, as a concrete case, a motor with shaft extended at one end only, the connection to the load being by a coupling mounted on the extended shaft. The two ends of the motor may then be called "front end" and "coupling end." Suppose, further, that when the observer faces the front end of the motor, the rotor is to turn clockwise.

The two motor-elements must be wound for different numbers of poles. If both have the same number, the spinner will rotate at practically synchronous speed, so that there will be little or no relative slip between the internal magnetic field and the rotor; this follows from the fact that the spinner and the internal magnetic field are traveling at practically the same speed in opposite directions, so that their sum is almost zero. Such a motor would be very inefficient.

Assume the stator wound for the smaller number of poles and the spinner for the larger. This is undesirable electrically because the lower-speed motor should have the larger diameter at the gap. Since the rotor is to turn clockwise, the internal polar winding on the spinner will be connected for clockwise rotation of the magnetic field. This requires that the magnetic field of the stator rotate counterclockwise. With the stator unexcited, assume voltage to be impressed upon the spinner. If the countertorque of the load at start exceeds the friction countertorque of the spinner, which is probable, the spinner will start and accelerate rapidly up to nearly synchronous speed counterclockwise, while the rotor remains stationary. A little reflection will confirm this description of the rotation of the spinner, because only in this way can the slip of the magnetic field past the rotor be reduced to a running-light value.

With the spinner running at the no-load speed corresponding to the larger number of poles, let the stator be excited. As soon as this is done the stator exerts a large torque on the spinner because it is running considerably below the stator synchronous speed and accelerates it to the higher speed. The spinner is now rotating counterclockwise faster than the magnetic field is traveling clockwise, so that this magnetic field has an angular velocity in space counterclockwise equal to (practically) the difference between the synchronous speeds of the two elements. The rotor will tend to follow this magnetic field and will try to run counterclockwise. If it does not revolve as fast as the magnetic field, the electrical relations are the same as those of an induction motor run at a negative slip and instead of the rotor exerting a torque it consumes torque, so that this arrangement is absolutely inoperative.

If the rotor runs counterclockwise a little faster than the magnetic field a torque is developed tending to accelerate the rotor in a clockwise direction so as to decrease the slip between it and the internal magnetic field. There is also a drag on the spinner in a clockwise direction which operates to reduce its slip with respect to the stator, which in turn reduces the torque exerted by the stator. The final result will be that the spinner is driven above the higher synchronous speed and becomes an induction generator, producing a drag on the spinner which balances the pull of the internal magnetic field. This arrangement is operative, the spinner consuming power from the line, transmitting some through the rotor to the load, and returning the rest (minus losses) to the line through the stator. The direction of rotation is counterclockwise instead of clockwise, but this can be reversed by reversing both sets of leads. This connection is then operative provided some external means for starting the rotor are provided, because, as shown above, the motor is not self-starting. If the motor is accelerated to the middle speed with the brake set, the speed can be decreased to the lower value by releasing the brake and making the necessary adjustments of connections to the line.

Assume, now, the stator wound for the larger number of poles, and the spinner wound for the higher speed. As noted above, this is the more advisable arrangement. Assume again the internal magnetic field connected for clockwise rotation. Let it be excited, and the spinner again comes up to speed counterclockwise, while the rotor remains stationary. This time, however, the spinner runs light at almost the higher synchronous speed. If now the stator is connected to the line so that its magnetic field rotates counterclockwise, the spinner and the stator become an induction generator consuming power from the spinner, which decreases its speed to a little above the lower synchronous value. The internal magnetic field thus acquires a clockwise rotation in space equal almost to the difference between the two synchronous speeds. As it acquires velocity it accelerates the rotor with it, so that this motor can be brought gradually up to operating speed. Here

again the power is supplied to the spinner, transmitted in part to the rotor, and in part returned to the line through the stator. If the load on the motor increases, the rotor exerts a greater pull on the spinner, increasing its speed in a counterclockwise direction; this means a greater negative slip of the spinner with reference to the stator, producing a countertorque to oppose the load torque. This arrangement is thus entirely stable.

It has been mentioned that the operation is partly by circulation of power through stator, spinner and the line. It may be interesting to consider how much power is circulated for a given motor output. Assume 10 poles and 14 poles and a frequency of 60 cycles. The synchronous speeds are 720 r.p.m. and 514 r.p.m., giving 206 r.p.m. as synchronism for the low speed. The full-load speed is considerably less, as the slip of both elements must be subtracted. If each is 2 per cent, the full-load speed is about 181 r.p.m. If the motor is rated at 100 hp, then the stator exerts $\frac{584}{181}$ 100 hp, or 278 synchronous horse-power in torque, and the spinner exerts $\frac{706}{181}$ 100 hp, or 381 synchronous horse-power in torque. Thus over 2¾ times as much power is circulated as is delivered to the load. This fact shows that the motor must be designed with very low copper loss in order to maintain the efficiency.

Spacing of Light Units.

By Alfred A. Wohlauer.

A correct physical conception of the flux of light leads immediately to the conclusion that in order to obtain a certain illumination a knowledge of the candle-power rating of the illuminants to be employed is sufficient for an exact determination of their distance apart; for it is a well-known fact that a certain total quantity of light flux can illuminate only a certain limited area with a certain illumination or flux density, and this area again affords a means for determining the distance between the lamps. There is, furthermore, a distinct numerical relation between the number of light sources, the area of the plane to be illuminated and the distance between the illuminants, these three quantities being interlinked in such a way that one of them can readily be ascertained when the other two are known.

In view of these facts, it seemed to the writer hardly necessary to enter into a special discussion on the topic of the spacing of light sources, at least up to the present time, it being considered sufficient to explain the physical as well as the numerical relations and to point to the various possibilities arising from a proper engineering treatment of this subject. It happened, however, of late that certain solutions of this problem offered in technical and trade publications are apt to disprove this very important task of engineering activity of its significant character. On this account it may be useful to dwell somewhat extensively on this question and bring before the reader considerations and relations which are of importance in connection with the engineering of the spacing of light sources.

The fundamental equation which may form the starting point from which all further determinations can be derived is the following:

$$D = \sqrt{aU \div Y} \qquad (1)$$

where

D = distance between the lamps, for rectangular spacing, in feet.
U = output of light unit, in mean spherical candle-power.
Y = expected illumination, in foot-candles, or the light flux density in lumens per square foot.
a = a factor.

The factor a, which forms the link connecting theoretical and practical illuminating engineering, is numerically equal to the number of effective lumens per mean spherical candle-power, and, therefore, gives an idea of the illuminating engineering efficiency of the installation. At an efficiency of 100 per cent it has the value of $4\pi = 12.57$. The factor a is an empirical value and must be ascertained by experiment or derived from actual installations. At the present state of illuminating engineering, lamp manufacture and reflector design, it has a general value of from 5 to 6 with an approximation sufficient for all conservative preliminary calculations as well as for general determinations of the contractor or architect. This value corresponds to an illuminating engineering efficiency of from 40 per cent to 50 per cent, and holds true for all commercial lamps on the market at the present time—for carbon and metal filament lamps in connection with prismatic or opal reflectors, for Nernst lamps in connection with alabaster globes, etc.—in short, for all general or commercial illuminating engineering. For more exact work in connection with the use of specially designed reflectors, etc., the factor a will be larger; it may run up to eight and even assume higher values, while under specially unfavorable conditions or in case of faulty designs its value may be found around three. Still, for all off-hand determinations the value five is a safe one to use.

Independent of the factor a the distance between the illuminants depends with theoretical as well as practical correctness only on the mean spherical candle-power (flux) of the lamps and on the illumination to be obtained, as expressed by the above formula. In order to demonstrate this relation and its significance for practical designs, the above table has been calculated by means of this formula. On account of practical considerations, it was found desirable to introduce into the table a number of the most popular lamps with their corresponding mean spherical candle-power instead of choosing a series of assumed candle-powers or light fluxes. For similar reasons of a purely practical nature, the value of the factor a was assumed as the same in all cases, namely 5. This is all the more justified as it constitutes the further advantage of revealing a true picture of actual and practical relations considered on an equal basis.

Thus, it is interesting and valuable to know, for instance, that 8-cp carbon lamps spaced 4 ft. apart give an illumination of 2 foot-candles while 25-watt tantalum lamps should be spaced 5 ft. apart in order to produce the same illumination.

Spacing of Lamps in Feet.

Commercial rating of lamps.	Mean spherical candle-power.	Flux in lumens.	Effective illumination in foot-candles or lumens per square foot: 1	2	3	4	5	6	7	8	9	10
8-cp carbon	6.4	80	5.67	4.00	3.25	2.83	2.50	2.33	2.16	2.00	1.92	1.83
25-watt tantalum	10	125	7.08	5.00	4.08	3.50	3.17	2.92	2.67	2.50	2.33	2.25
16-cp carbon	12.5	157	7.83	5.67	4.58	3.91	3.50	3.25	3.00	2.83	2.67	2.50
25-watt tungsten 50-watt Gem 40-watt tantalum	16	200	8.91	6.33	5.17	4.50	4.00	3.67	3.42	3.17	3.00	2.83
32-cp carbon 80-watt Gem 66-watt Nernst 40-watt tungsten	25.6	320	11.67	8.00	6.50	5.58	5.83	4.67	4.33	4.00	3.75	3.58
80-watt tantalum	32	400	12.58	8.91	7.42	6.33	5.67	5.17	4.75	4.50	4.25	4.00
88-watt Nernst 60-watt tungsten	38.5	480	13.75	9.75	8.00	6.92	6.17	5.67	5.25	4.83	4.58	4.33
110-watt Nernst	48	600	15.50	10.91	8.91	7.75	6.83	6.33	5.83	5.50	5.17	4.92
132-watt Nernst	60	750	17.33	12.25	10.00	8.67	7.75	7.08	6.58	6.17	5.75	5.42
100-watt tungsten	64	800	17.75	12.58	10.33	8.92	8.00	7.33	6.75	6.33	5.92	5.75
250-watt tungsten	160	2,000	24.33	20.00	16.25	14.17	12.58	11.50	10.67	10.00	9.42	8.92
5-amp enclosed arc 4-glower Nernst	250	3,140	35.33	25.00	20.42	17.67	15.75	14.42	13.33	12.50	11.33	10.67
10-amp flaming arc	1,100	13,800	74.00	52.33	44.75	37.00	33.00	30.17	28.00	26.17	24.67	23.42

Eight feet is the distance for an illumination of 2 foot-candles in the case of the 32-cp carbon lamp, 80-watt Gem lamp, 66-watt Nernst lamp and 40-watt tungsten lamp, the rated mean spherical candle-power for all of which has practically the value of 38.5. The 88-watt Nernst lamps give 3 foot-candles if suspended 8 ft. apart, while the 100-watt tungsten lamp gives 5 foot-candles at the same distance. One can thus easily determine the distance between the lamps, the value of which will prove correct whatever the wattage of the lamp, the light distribution or height of suspension may be.

If the number of lamps to be used is large, hardly anything is left to be added in regard to the remaining steps in the design of illumination, since there is ample, if not unlimited, scope for the selection of the light distribution curve or the height of suspension, as has been pointed out in an article of the writer in the *Electrical World* for March 21, 1909.

The rule for the location of outlets in the case of a comparatively large number of lamps can be stated as follows: Divide the area to be illuminated into squares, the size of which have a length equal to the distance determined by means of the above formula, and suspend the lamps above the centers of these squares at any height which is convenient with respect to local conditions. One restriction should be made, which, however, is rarely of importance in practice, namely, that the minimum height of suspension should not be smaller than one-half of the distance between lamps. When the room to be illuminated is so low that the possible height of suspension of the lamps is smaller than one-half of the distance, calculated by means of formula No. 1, smaller illuminants must be chosen in order to be able to bring the lamps closer together, thereby obtaining a practicable light distribution. However, for rooms of usual and more than usual height, the height of suspension of the lamps, as well as their light distribution, is irrelevant with respect to the illumination or its uniformity, as has been sufficiently explained by the writer in former articles in this journal.

For a comparatively small number of lamps the light distribution and height of suspension must be taken into account though they do not influence the distance between the lamps. In order to obtain the desired illumination, the height of suspension and the light distribution of the individual lamps must be selected and mutually adapted in such a way that the expected illumination is obtained at every point of the plane. The foremost and most plausible rule therefor may be expressed by the well-known formula:

$$u = Yh^3 \qquad (2)$$

wherein

u = candle-power of lamp vertically downward.
Y = illumination to be obtained, in foot-candles, or lumens per square foot.
h = height of suspension, in feet.

In the case of a single lamp, the light distribution curve should be such that the candle-power increases with increasing angle between light ray and the vertical in order to obtain nearly uniform illumination for a certain area, while for two or more lamps the candle-power u has usually the maximum value and decreases with increasing angle between the light vector and the vertical. The reflectors should then be designed accordingly, unless the original light distribution curve of a lamp or of a lamp unit with reflector answers the purpose.

For practical and commercial illuminating engineering it is hardly feasible every time to design special reflectors or light units according to the special or most favorable conditions; one must rather rely upon commercial products of lamps and reflectors which are offered on the market, but he may eventually modify the height of suspension according to the light distribution curve of the unit chosen.

The following rules should, therefore, be added to the above for the design of illumination in a case of a small number of lamps: After the distance between the lamps has been determined according to formula No. 1, the proper height of suspension should be selected with respect to the local requirements. The light distribution curve of the lamps should be decided upon with respect to formula No. 2. The height of suspension must eventually be modified according to commercial light distribution curves; only in extreme cases should the size of the lamp and the corresponding distance between the lamps be altered.

It is always preferable to suspend the lamps as high as possible, in order to remove them from plain view and to shield the eyes against glare; moreover, as in the case of a large number of lamps, the height of suspension of the lamps should never be smaller than one-half of the distance between them.

It may be added that these rules are applicable only to calculations of the so-called general illumination for which uniformity is most desirable. For localized illumination—for instance, in the case of workroom tables and desk illumination—different conditions prevail, which, as a rule, are subject to individual treatment and special design.

It, furthermore, may be remarked in regard to the intermediate territory which lies between comparatively large and comparatively small numbers of lamps, that it must be left to the judgment of the designing engineer to decide whether it is necessary to take the light distribution and the height of suspension into account. Of course, the results will be more accurate and the illumination obtained more uniform and satisfactory if attention is paid to the light distribution and the height of suspension; still, if this is overlooked even in the case of a small number of lamps, the mean or average illumination obtained will correspond to the one introduced into calculation with formula No. 1, though the illumination will be rather uneven and perhaps too small just where more light is required.

To give a résumé of this article, it is well to state that for a certain definite candle-power rating of lamp the distance between the lamps depends only on the illumination to be obtained; it is not influenced by the height of suspension, nor by the light distribution curve of the individual lamps. There is only one distance that can be allowed between illuminants of a certain flux in order to obtain a certain average illumination, and while in the case of a large number of lamps the light distribution of the individual lamp is of minor importance as to the unevenness of illumination, for a comparatively small number of lamps the height of suspension and the distribution of light from each lamp have to be taken into account to obtain a fairly uniform illumination of sufficient density at all points.

Operation of the 110,000-Volt System of the Grand Rapids-Muskegon Power Company.

Articles relating to the electrical generating and transmitting equipments of the Grand Rapids-Muskegon Power Company have appeared from time to time in our columns. Our issue for Nov. 3, 1906, contained a description of the 66,000-volt installation deriving its energy from Rogers Dam. An article in our issue for Sept. 14, 1907, dealt with the successful operation of the transmission circuits at 72,000 volts, while the 110,000-volt installation of the company was described in our issues for Nov. 2, 1907, and Feb. 4, 1909. However, many of the interesting features of this pioneer equipment have not been discussed previously.

In addition to employing a higher e.m.f. than previously attempted, the plant is unique in its simplicity. The only automatic device in the whole system is the speed regulator for the water turbines. In the high-tension lines there are no fuses, switches or cut-outs and no lightning arresters. Even in the low-tension side of the transformers at the generating station no use is made of regulating devices or automatic switches of any kind. As a matter of fact, the leads from the 6600-volt generators are connected directly to the primary coils of the transformers, and the secondary coils are joined directly to the 110,000-volt transmission lines without the insertion of any device whatsoever. In the generator leads there are oil switches operated by solenoids controlled by inverse-time element, bellows-type overload relays, but the switches have been plugged

shut so that they are no longer in circuit. However, the system is protected from overload by circuit-breakers in the distributing circuits, while the fact that the turbines are incapable of operating the generators at a dangerous overload furnishes additional protection.

Experiments have shown that when the e.m.f. on the transmission line is increased by, say, 10 per cent, the line loss due to "corona" discharges increases by almost 100 per cent. This condition shows that the line is operated at a voltage only slightly below the maximum permissible value for the present physical arrangement of the circuits. Due to this fact, any increase in the e.m.f. induced by lightning produces an excess of corona loss, and tends to minimize the disturbance from lightning, while the high factor of safety used in the line insulators provides protection to the line. This conclusion seems justified by the operation of the 110,000-volt line continuously under lightning conditions which caused damage to an adjacent 70,000-volt line constructed along the same right-of-way according to standard practice, and provided with the usual lightning protective devices. However, for the protection of the apparatus at the terminals of the 110,000-volt lines, use will be made the coming season of lightning arresters of the electrolytic type.

The energy for the 110,000-volt system is obtained from a hydro-electric installation at Croton, on the Muskegon River, from which place it is transmitted 40 miles to Grand Rapids. A dam across the river at Croton affords an effective head of 40 ft. by joining a lake 12 miles in length along the bed of the Muskegon. The dam, which is of concrete, provides one of the walls for the wheel house and generator-room. It is equipped with motor-operated discharge gates and log spillways, but no extra precautions have been taken for the removal of floating ice, because the still water of the lake allows the ice to form and then to melt without floating down stream.

The generating equipment consists of two 3000-kw Westinghouse, three-phase, 6600-volt, 30-cycle alternators, each of which is driven by eight horizontal-shaft Leffel turbines to which it is direct-connected. The reason for using so large a number of turbines for each generator resides in the fact that for the head available the arrangement selected afforded the most economical equipment for the power developed. The speed of each generator is controlled by two Lombard governors, each of which regulates the water admitted to two pairs of turbines. The speed at which the governors tend to cause the generator to operate is set by means of a miniature direct-current motor receiving power from the exciter circuits and remotely controlled by push buttons on the switchboard. A synchronoscope is used in paralleling the two generators for connection through 6600-volt busbars.

Each alternator is provided with a 40-kw exciter mounted on an end of its shaft extended beyond the main ring-oiler bearing. The usual array of exciter instruments and controlling devices is conspicuous by its absence. The exciter terminals are joined directly to the terminals of the field coils of the alternator, the only method of varying the e.m.f. of the alternator being by means of the rheostat in the field circuit of the exciter generator. The exciter is a compound-wound machine, but the series coils are not used. The alternator is provided with a field-circuit rheostat, but this has been abandoned. Moreover, the 6600-volt oil switches in the main alternator leads are no longer used, as noted above. The switchboard for each alternator contains a single ammeter and wattmeter, two push-button devices for setting the speed of the machine and an exciter field-circuit rheostat; the handle for the 6600-volt switches, which are located immediately behind the board, an overload relay and an alternator field-circuit rheostat are also represented on the board, but are not utilized.

The only devices in the main alternator leads are air-break disconnecting switches and series transformers. In case it becomes necessary for the attendant to open the circuit under load the oil switches, which normally are fastened in the closed position, can be released and operated by hand or by the relay.

The 6600-volt leads are joined directly in delta to the primary circuits of three Westinghouse oil-insulated, water-cooled transformers, the secondary circuits of which are connected in delta to the 110,000-volt transmission lines. The only prominent features of the transformers are the secondary bushings, which have been made extra long for the high voltage. The lines leave the building by way of porcelain disk bushings mounted in wooden windows; each line is anchored against the opposite side of the building by five disk-type General Electric strain insulators, each of which is rated for 25,000 volts and the five for 125,000 volts.

The transmission line, which was described in our issue for Feb. 4, 1909, contains three cables suspended by disk insulators from steel towers, spaced 10 per mile. Each cable consists of six strands of No. 10 copper wire with hemp core. Joints in the cable are made by means of figure 8 copper tubing, which is given a total of three complete turns per joint. There are five 25,000-volt insulating disks at each point of suspension. The efficiency of the arrangement of the line is shown by the fact that the only mechanical defect was developed during an unusually severe sleet storm, when one of the cables gave way under the excess load, while the only electrical break-down occurred to two of the five disks at one tower, which caused no interruption, because the remaining three supported the line and provided adequate insulation.

At the main substation in Grand Rapids there are three 3750-kw, oil-insulated, water-cooled transformers, duplicates of those at the generating station. No switches are used in the primary leads, which are joined directly to the 110,000-volt transmission cables according to an arrangement similar to that used at the generating station. The substation is provided with the usual equipment of recording devices, oil switches, etc., for a 6600-volt distributing system. Air-insulated busbars allow the 110,000-volt transmission system to be paralleled on the 6600-volt secondary side with a 70,000-volt system which transmits energy 60 miles from Rogers Dam, 20 miles upstream on the Muskegon above Croton. For the latter system the substation contains three 1250-kw, 70,000-volt to 6600-volt, oil-insulated, water-cooled transformers. The 70,000-volt transmission wires are carried on pin insulators arranged on wooden poles. For 40 miles, or to Croton, it runs adjacent to the 110,000-volt transmission system. A compartment in the station at Croton is employed for disconnecting switches for the 70,000-volt circuits, but these circuits are in nowise interconnected with the 110,000-volt system except at the Grand Rapids substation, as noted above.

For the purpose of assisting the transmission system in time of low water the Grand Rapids-Muskegon Power Company is erecting at its substation a steam-turbine generating station. This station will contain a 4500-kw turbo-alternator as its initial equipment. It will be provided with a concrete stack having the noteworthy height of 250 ft. The electrical engineer of the company is Mr. J. B. Foote, who planned the unusual arrangements outlined above.

Water-Power Legislation in Norway.

The Norwegian Parliament has passed a measure relative to the future exploitation of the country's water-power, according to which all waterfalls with a capacity of more than 1000 hp which hereafter are sold to a limited company, whether entirely Norwegian or not, shall pass into the possession of the State after the expiration of the concession. Concessions are given for a period of not less than 60 nor more than 80 years, and at the lapse of the grant the waterfall with all regulating works connected with it becomes Government property with full ownership and without compensation. It can also be decreed that the power stations, with plant and other equipment, shall also pass into the possession of the State without remuneration. Whatever else is not covered by the measure can be acquired by condemnation proceedings, or the State can demand the removal of a plant before a certain date. Attempts to modify the measure and to exempt waterfalls under 3000 hp, and a proposal to give the concessionaire an option to rent the water-power and plant for a certain period after the expiration of the grant, failed of adoption.

CENTRAL STATION

MANAGEMENT, POLICIES AND COMMERCIAL METHODS

Day Circuit at Abingdon, Ill.

The Abingdon Electric Company, of Abingdon, Ill., which gives central-station service in a town of about 3000 inhabitants, has operated a day circuit for about one year. It has about 75 hp in motors connected, and the day service is just beginning to pay its way. The rating of the plant is 200 kw, of which 50 kw is in a three-phase alternator belted to an Ide engine and 150 kw in a three-phase alternator belted to a Bates-Corliss engine. The 50-kw unit carries the day load. During a recent visit to the plant the load at 11 a. m. was about 26 kva.

The company has pumped water for the city by piping steam across the street to the city water works for the operation of a deep-well pump from a direct-acting fire pump. This service it has performed at $55 per month, and it is believed by those connected with the company that this has been done at a loss, as the steam-pumping apparatus is very inefficient. Nevertheless, the City Council seems not to be satisfied even with this low figure. It is preparing to put boilers in the city plant and operate the plant. How this can be done when the city must hire a man to run the plant in addition to paying coal bills has not been made clear. With motor-operated pumps this work could probably be done with profit to both parties concerned.

Handling of Central-Station Construction Work.

The Macomb Electric Light & Gas Company, of Macomb, Ill., has an interesting practice in the handling of construction work and extensions. Instead of keeping men who divide their time between maintenance of lines, setting of meters and the running of new services and other extensions, as is usually done in towns of about 6000 inhabitants, this company keeps no men for this irregular work, but employs the local electrical contractor, which is the Macomb Electric Construction Company, under the management of Mr. W. I. Savidge. The advantage of this plan from a central-station standpoint is that it is not necessary to employ men constantly and keep them on the payroll for irregular work. The company pays the contractor about 25 per cent over and above the regular wages paid to the men. From the contractor's standpoint the scheme works well, because it gives steady employment to a larger number of men than could otherwise be employed, and makes it possible to handle large contracts properly without employing extra men. In other words, both the central station and the contractor are taking advantage of the diversity factor in the contractor's business and utilizing the same principle that makes central-station business profitable.

The electric end of the central-station company's business is handled by two engineers, who do their own firing, and one extra fireman. The manager and the bookkeeper divide their time between the gas and electric business. The plant contains one 75-kw and one 150-kw, three-phase alternator, each unit being belted to a Bates-Corliss engine. The boiler-room is just being remodeled, and two new horizontal return-flue boilers 6 ft. x 18 ft. are being installed. Owing to the fact that the gas business was started in Macomb before the electric business, the gas distribution system covers the city more thoroughly than the electrical. The company has an unusual number of gas ranges installed, and gas lighting in many of the residences has tended to keep down the number of electric consumers.

Twenty-four-hour service has been given about four years. It took the company one year to get the day service on a paying basis. The connected motor load is now nearly 100 hp, not including 165 fans. The company has a contract for pumping part of the city water. This is done at a rate of 2.25 cents per kw-hour, as metered at the central station. A 25-hp, three-phase motor is used, which belongs to the company, all of the other pumping equipment belonging to the city. The city water supply has been somewhat short, so that the electric pumps only pump about 60,000 gal. per day. The company's revenue from water pumping is from $180 to $250 per month.

A Chicago Flatiron Campaign.

As related in the *Electrical World* of April 8 last, the Commonwealth Edison Company, of Chicago, placed 10,000 6-lb. household flatirons in the homes of Chicago between Dec. 15, 1908, and March 17, 1909. These irons were loaned to customers of the company for six months without charge. They were placed by direct personal appeal following circulars with return postcards addressed to all the customers of the company who might be interested. Responses from the circularizing were followed up by young men who secured orders for the irons, delivered them and demonstrated them. The utensils were sent out in wagon-loads with four men to a wagon in charge of a captain. The men were paid a salary and commission. The plan provided that the customer could obtain the iron for six months, rental free, provided the irons were used regularly.

At the expiration of the six-month period letters were sent out, signed by Mr. E. W. Lloyd, general contract agent of the Commonwealth Edison Company, saying that, although the regular selling price of the iron was $4.50, a special price of $2 had been established for the irons on loan. Users were invited to take advantage of this reduced price and keep the irons as their permanent property. Return postcards were enclosed in these letters also, and up to Sept. 7 about 3000 of the irons had been sold to customers who had obtained them under the loan plan. The company has no doubt that in time all of the 10,000 irons will be sold outright. It was anticipated that probably quite a number of the loaned irons would be returned, and it was arranged that these returned irons would be sent out on another 30-day loan to other customers or sold outright as used irons at the $2 rate. Only used irons were sold at this reduced rate, however. The customers availing themselves of the 30-day loan arrangement had the privilege of retaining the irons for $2 each. This plan proved popular, and there was soon a waiting list of over 200 for the loan and sale of used irons. It was found that there was such a demand for the purchase of used irons at the $2 rate that the 30-day loan plan was gradually abandoned.

This flatiron campaign, undertaken on an unusually large scale, has been remarkably successful, and indicates the real demand for these convenient utensils.

One of the complaints against "ironing day" caused by the old method of heating irons on a stove is due to the fact that it compels women to remain on their feet all day long. The electric iron does away with this great objection, with the further advantage that there is no heat from the ironing stove to make the room uncomfortably warm. The point was brought out forcibly in a letter received by the Commonwealth Edison Company from a customer who received an electric flatiron under a six-month loan plan, and was notified that he could purchase the iron outright at the end of that period for a reduced price. In responding to this invitation the customer wrote the following interesting and self-explanatory letter:

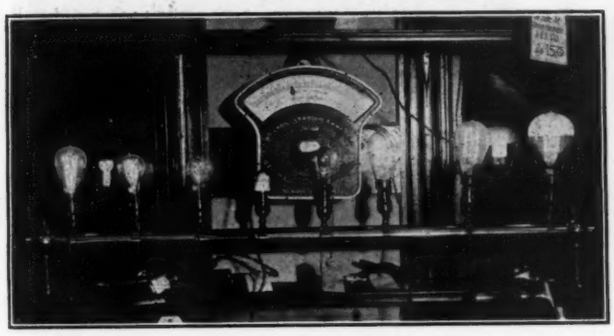
"I am only too glad to mail check for the $2 for the iron, for since it came into the house my wife has never used any other. She was not able to do her ironing before on account of standing. Now she sits down and goes ahead. She thinks it is the greatest blessing we have."

Office Exhibit of Narragansett Electric Lighting Company.

An interesting exhibit of electrical appliances is at present being maintained by the Narragansett Electric Lighting Company, of Providence, R. I., at the main offices of the organization in the business center of the city. The company's headquarters are up one flight in the Union Trust Building, and the windows are utilized for sign purposes, on each side of the premises. The designations on the windows, which are easily read from the street level or from passing cars, are as follows:

Narragansett Electric Lighting Company. Electric Power Ideal Drive. Electric Heat Without Fire or Flame. Electric Light Safe and Clean. Electric Light the Best Light. Electric Signs Increase Business.

Passing into the building and upstairs or via the elevators one is immediately attracted into the offices on reaching the second floor by the electrical display, which can be seen from the elevator car. A large variety of motors, heaters, lamps, shades,



OFFICE EXHIBIT OF NARRAGANSETT ELECTRIC LIGHTING COMPANY.

fittings and other equipment for office and domestic uses are shown close by the bill clerk's window and throughout the rest of the room. A feature of interest is illustrated herewith. It consists of an ammeter calibrated to read in the operating cost in cents per hour at the company's prevailing rates, and arranged so that any lamp or other moderate device of capacity on the wall or the table below can be connected to the instrument and the cost of operating it immediately shown to the prospective purchaser. In the photograph the ammeter is shown mounted behind a number of tungsten and carbon-incandescent lamps of different sizes, which are provided with plugs for insertion into the circuits running through the office. The exhibit has attracted wide attention locally on account of the simple way in which it shows operating cost.

Campaign for Electric Heating Devices.

Following its successful electric flatiron campaign, the Commonwealth Edison Company, of Chicago, has begun a new campaign to introduce industrial electric heating appliances, particularly the electric soldering iron. A circular letter has been sent out signed by Mr. George B. Johnson, in charge of the electric heating and specialty division of the contract department, calling the attention of men in charge of manufacturing establishments, repair shops, garages and places of like character to the advantages of the electric soldering iron, the tool recommended being made in seven sizes. In the circular letter the advantages to be derived from the use of these tools are pointed out. Among these advantages are convenience in use under automobiles and in other places where it is difficult to keep the ordinary soldering iron hot while the work is being done. In addition, the electric soldering iron can be used in places where it is dangerous to have an open flame; furthermore, the heat is generated at the tip, ready for instant conversion into work. The cost of operation is moderate, a medium-sized iron using only 120 watts, or but a trifle more than two ordinary 16-cp lamps.

Encouraging results have followed the effort to introduce electric heating tools on a wide scale, and these appliances have already been introduced into a number of manufacturing and repair establishments as the result of this campaign. One method of securing this class of business is worthy of special mention. Each of the company's solicitors for light and power is provided with a pad of blank forms 5½ in. wide and 3¼ in. high, reproduced in fac-simile herewith. When the solicitor, in making his rounds, receives any request for information in relation to electric heating or specialties he fills out this blank and sends it to Mr. Johnson, who has charge of this particular work in the contract department. A specialist from Mr. Johnson's division then follows up the "prospect" and secures the business if possible. If he is successful, the agent who sent in the "tip" is notified, and he gets credit for the amount of electricity consumed by the device sold in 50-watt equivalents. The man from Mr. Johnson's division, who actually concludes the deal, gets the credit for the sale of the apparatus.

The Commonwealth Edison Company maintains a division of its contract department for the sole purpose of looking out for

REQUEST FOR INFORMATION
REGARDING ELECTRIC HEATING AND SPECIALTIES

MEMO.
DATE REC'D _____
REMARKS _____
ORDERED _____ 190__
SECURED BY _____
ORDER NO. _____
DELIVERED _____ 190__
NOTIFIED AGENT _____ 190__

MR. GEO. B. JOHNSON _____ 190__
DEAR SIR:—
THE FOLLOWING PARTY DESIRES INFORMATION
REGARDING _____
NAME _____
ADDRESS _____
AGENT _____ SIGNED

AGENT WILL BE NOTIFIED WHEN ORDER IS SECURED

BLANK FORM FOR SOLICITORS FOR LIGHT AND POWER.

business of this class, which also includes electric flatirons, electric fans, ozone generators and various specialties and novelties. There is probably enough of this business to be had in every community to warrant the employment of at least one person to give his time exclusively to this line of development, and station managers may find it to their advantage to give more attention to the various electric specialties than they have done in the past. These devices add but little load singly, but in the aggregate they bring in a respectable volume of business. Furthermore, they are of a character that usually appeals to the public.

INTERIOR WIRING AND ILLUMINATION

The Engineer and the Contractor.

Mr. Onward Bates, the noted Chicago engineer, in a recent commencement address at the Rensselaer Polytechnic Institute, pays tribute to the importance of the work of the contractor in terms which will be of interest to many electrical readers. "The engineer's education," says Mr. Bates, "'supplemented by business knowledge and the ability to handle men, makes the ideal contractor. For this reason the contractor's occupation offers an attractive field for engineers, and it is becoming common to find them engaged in it. With the great works carried on in these days, it is frequently the case that as much engineering talent is required in construction as in the making of plans. In such cases the engineer shares in the financial risk, and if successful his reward is greater than when employed under a salary. The old idea that engineers are saints and contractors sinners is going out of fashion. The men are the same under either title, and engineers become contractors without loss of self-respect, and without losing their rank as engineers."

New Concrete Arc Lamp Posts in Lincoln Park, Chicago.

A new type of lamp post especially designed for Lincoln Park, Chicago, and made of concrete, is being placed in that well-known pleasure ground. Although it is strong and substantial in appearance, as it is in reality, it is also notably attractive. The post is square, with chamfered corners, and the shaft tapers slightly above a spreading base having extreme dimensions of 2 ft. 4 in. square, until it is 7½ in. in diameter at the top. The post supports a 20-in. opalescent glass globe in which is placed a series 7½-amp Jandus arc lamp and operated by alternating current supplied from the Sanitary District's hydro-electric plant on the Drainage Canal. The center of the globe is 15 ft. above the base of the post.

The concrete of which the post is made consists of one part of Blanc cement, three parts of white sand and five parts of red granite screenings. The post is given a bush-hammer finish and is washed down with acid. The red granite gives it a pinkish tinge which contrasts well with the artistic metallic top piece, which is of cast bronze with verde-antique finish. Iron molds are used in making the post. About 170 of these handsome fixtures will be installed in the park at present; ultimately

CONCRETE LAMP POSTS IN LINCOLN PARK, CHICAGO.

all of the outdoor lamps for Lincoln Park will be supported on posts of this type. On streets and park roads the lamp will be spaced about 100 ft. apart on each side of the street.

This lamp post, which has also been adopted for the parks in Cincinnati, was designed by Messrs. Perkins & Hamilton, architects, of Chicago. It is not reinforced, except by the 1½-in. iron pipe encased within it, which serves to conduct the wires to the lamp. Architecturally, it is noteworthy in that it is not treated as a column, with a capital, as in the case of many other boulevard lamp posts surmounted by round globes.

Tungsten Street Arches in Michigan.

At the Michigan Electric Association convention at Detroit in August, there was naturally much discussion, both formally and informally, on the system of lighting downtown streets by means of arches of tungsten lamps hung from span wires suspended between buildings. Mr. W. J. Trott, representative of the Fostoria Incandescent Lamp Company, at Grand Rapids, furnishes the following list of such arches in use in various towns at the present time which have come under his knowledge:

Greenville, Mich.—Eight arches, 10 lamps per arch, 3.5-amp lamps, 60 cp; on 220-volt circuit.

Petoskey, Mich.—Twenty-two arches, 12 lamps per arch, 5.5-amp, 60 cp; operated from 220-volt circuit.

Belding, Mich.—Nine arches, 12 lamps per arch, 4 amp, 32 cp; operated from 155-volt circuit.

Big Rapids.—Six arches, 10 lamps per arch, 5.5 amp, 60 cp; operated from 110-volt circuit.

Columbus, S. C.—Twelve arches, 17 lamps per arch, 6.6 amp, 60 cp.

Grand Rapids has the following arches, all operated from 220-volt circuits: Canal Street, 15 arches, 18 lamps, 5.5 amp, 60 cp; Monroe Street, 25 arches, 14 lamps, 4 amp, 60 cp; Division Street, 18 arches, 14 lamps, 4 amp, 60 cp; Ionia Street, 16

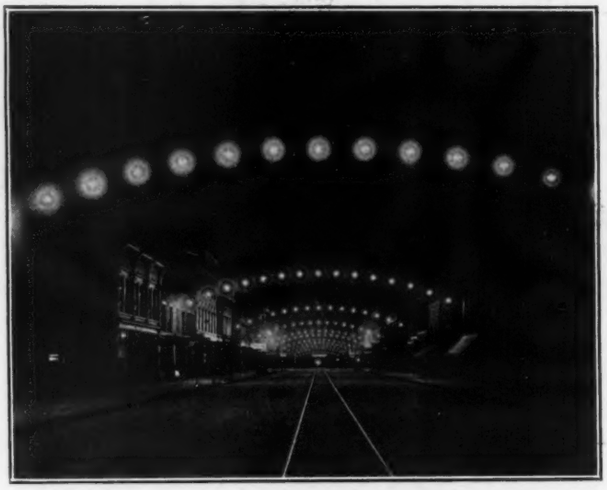


FIG. 1.—NIGHT VIEW OF ARCHES AT ADRIAN, MICH.

arches, 14 lamps, 4 amp, 60 cp; Market Street, 5 arches, 14 lamps, 4 amp, 60 cp.

With the various currents for which series-tungsten street lamps are made, it is easy to select a combination of lamps in series which will correspond in voltage to 110-volt or 220-volt circuits.

Mr. Harry Fee, manager of the Citizens' Light & Power Company, of Adrian, Mich., showed photographs of Adrian arches from which Figs. 1 and 2 are reproduced. The scheme of suspension differs from that originally used at Grand Rapids by having a steadying wire to which the lamp sockets are attached The original arches had lamps suspended from the span wire without this steadying wire. These arches were first put up for

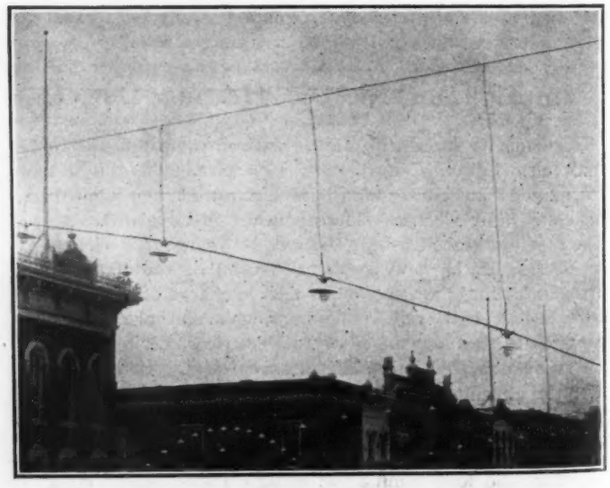


FIG. 2.—DETAILS OF ARCH CONSTRUCTION.

a celebration in Adrian, and the company has now offered to maintain these for the merchants at the rate of $6.25 per night. There are 15 lamps per arch. The total installation consists of 330 40-watt lamps. There are 22 arches, placed from 115 ft. to 79 ft. apart. The highest lamp is about 28 ft. above the pavement

Lighting of New Atlanta Auditorium.

BY JAMES O. SPEAR, JR.

Within the past few years manufacturers, realizing the value of accurate data on their product, have inaugurated publicity campaigns with benefits along at least two lines. First, professional men have become more familiar with the product so advertised, have the more easily found places for its use and have secured better results. Second, the fact that publicity was

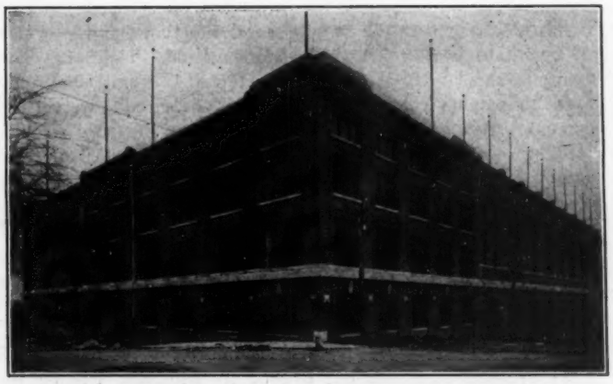


FIG. 1.—EXTERIOR VIEW OF ATLANTA AUDITORIUM.

to be given to the result of tests has proved an incentive to the manufacturer to keep abreast of the most advanced stage of the art. This has been especially true of lamps, reflectors and fixtures for lighting.

The advent of the tungsten lamp was the signal for an awakening and we soon had abundant examples of improved

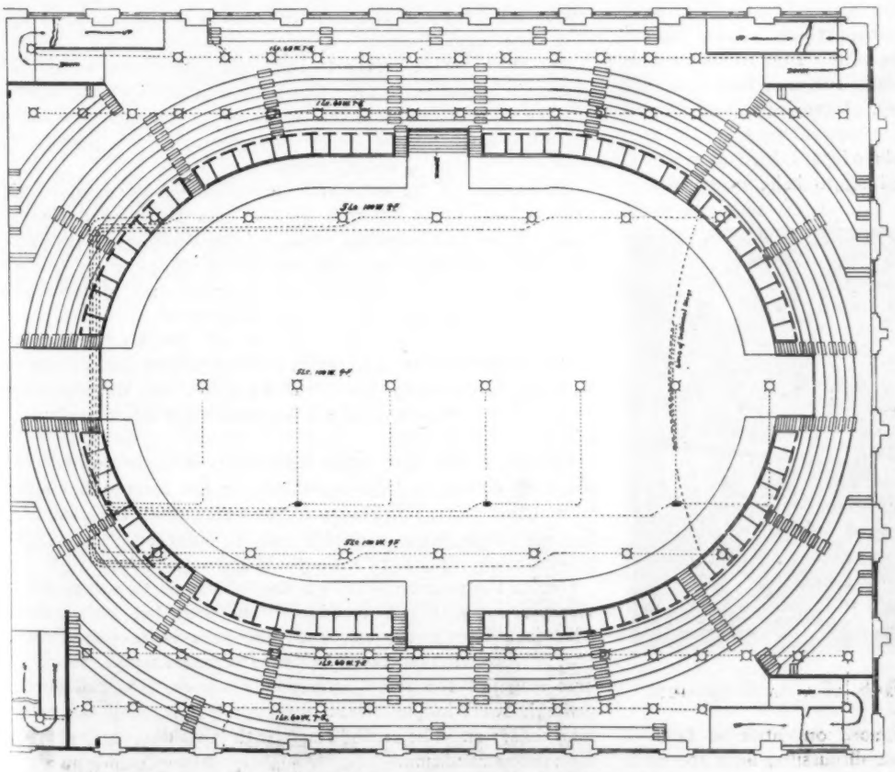


FIG. 2.—LIGHTING PLAN, ATLANTA AUDITORIUM.

lighting. So long familiar with the carbon-filament lamp, the temptation to use an equal number of the more brilliant units was often too strong, and one's eyes paid the penalty. In the past it has often happened that the factor of capacity for light-giving has been subordinated in an effort to have the lighting fixtures emphasize the architectural scheme. Nowhere has this done more damage than in churches and auditoriums. Too much or too little light—too great contrast in lighting—light in the line of vision, all cause fatigue to the eye and threaten permanent injury. The last two are by long odds a worse fault than the first.

	Plan No. 1.	Plan No. 2.	Plan No. 3.
Station A, midway of seats.....	.998	8.149	2.226
Station B, 35 feet from center.....	.648	5.146	2.074
Station C, center of arena.....	.776	3.539	2.099
Average candle-feet illumination...	.807	5.611	2.199

When a large auditorium was planned for the city of Atlanta, after other items had been taken care of in the budget, the lighting apparently got what was left, and plans were issued calling for arc lamps. Fortunately, before the completion of the building, the committee having it in charge was

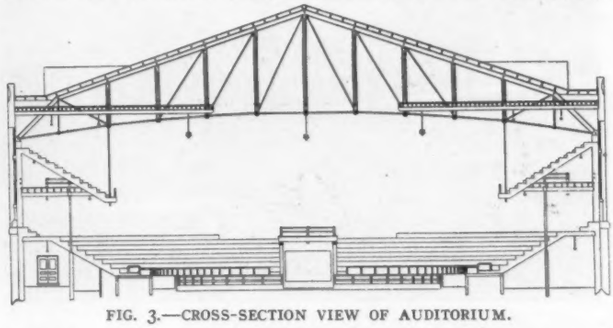


FIG. 3.—CROSS-SECTION VIEW OF AUDITORIUM.

brought to a realization of the importance of the matter of illumination and called for a report on lighting, first, by enclosed-arc lamps, second, by flaming-arc lamps, and, third, by tungsten-holophane units.

In the case of the flaming arcs it was proposed to use special prismatic inner globes where the ceilings were low. As a first essential it was recommended that all lights be above the line of vision from the upper balcony and the comparisons were made under these conditions. Three stations were selected for the purpose of comparison, and the writer's report showed the following results:

Plan No. 1 contemplated 38 550-watt enclosed-arc lamps, a total of 20,900 watts, equal to 0.427 watt per square foot.

Plan No. 2 contemplated 24 550-watt flaming-arc lamps, a total of 13,200 watts, equal to 0.269 watt per square foot.

Plan No. 3 contemplated 167 tungsten units, having a total wattage of 19,700, equal to 0.402 watt per square foot.

The figured illumination was as shown in the above table.

Plan No. 1 was ruled out on account of inadequacy of illumination. Plan No. 2 was also clearly out of the question because of the wide variation in intensity. The tungsten-holophane equipment was adopted and has excited only the most favorable comment. When it is considered that this auditorium will provide capacity for seating 8000 persons, the total, including foyer lights, etc., of 23.1 kw will at once appear small as a lighting load.

To return to the study of the basis for this layout. No plastering is used in the auditorium proper, the brick walls being left unpainted. For the sake of acoustics approximately 65 per

cent of the space under the roof is floored over, the joists and under side of floor being painted with cold-water white. The framing under the balcony and under the amphitheater is also finished in white. Floors, faces of boxes, etc., are stained in light brown. Under these conditions the walls contribute but little through reflection, and because of the height at which the main fixtures had to be hung—45 ft. above the plane of illumination—extreme concentration of light was essential.

The amphitheater or dress circle had the advantage of re-

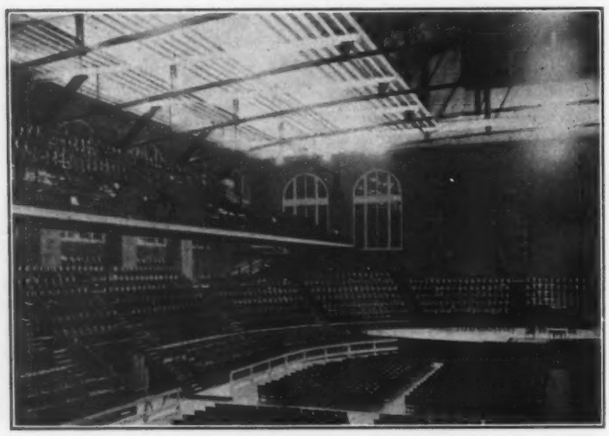


FIG. 4.—VIEW OF INTERIOR OF ATLANTA AUDITORIUM.

flection from the underside of the balcony, and having an average ceiling height of little over 15 ft., 61 60-watt clear-bulb tungsten lamps were allotted, 20 of these being used in intensive and 41 in extensive reflectors. The illumination of 2.226 candle-ft. was secured with an expenditure of 0.226 watt per square foot.

The average ceiling height over the gallery is 22½ ft., and although the white ceiling could be counted on for some help, an allotment of 58 60-watt clear-bulb tungsten lamps, or 0.35 watt per square foot, was necessary. Intensive reflectors were used throughout over the gallery.

The arena, with its ceiling height of 54½ ft., and with but the narrow edges of the white ceiling to help, presented the

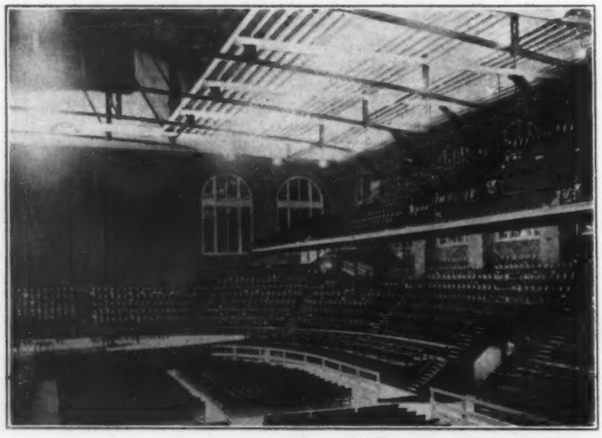


FIG. 5.—ANOTHER VIEW OF INTERIOR OF ATLANTA AUDITORIUM.

greatest difficulty. The equipment used consisted of 22 five-light Federal clusters with nickel-plated undercones, fitted with 100-watt clear-bulb tungsten lamps and focusing reflectors. An average illumination of 2.08 ft.-candles was secured with an expenditure of 0.67 watt per square foot.

For vestibules, stairways, etc., 60 bowl frosted tungsten lamps were used in extensive reflectors, the average wattage being 0.261 per square foot.

The total energy required for the whole building is 23,100 watts, equal to 0.368 watt per square foot. The sufficiency of the lighting and its evenness are best shown by the accompanying illustration engraved from a photograph made in 10 minutes with the lens stopped down to 16f.

New Telephone Patents.

EXCHANGE CIRCUIT SYSTEMS.

That the circuits of common-battery exchanges are subject to almost limitless variation has been evidenced by the numerout patents issued covering such circuits. Nearly all are designed to perform the same general functions, as the system of operation is now practically standardized. There have recently been issued to Mr. H. G. Webster, of Chicago, Ill., no less than 10 patents covering modifications of circuit system for common-battery exchanges employing two-strand cord circuits, ranging in date of application from 1904 to 1907. All of these patents have been assigned to Mr. M. G. Kellogg, and all are concerned with the signal system save one, which relates to the busy test.

Taking the patents at random, the first is found to employ a line relay and a double-wound cut-off relay, the battery being supplied with energy through both strands of the cord-circuit in parallel, a single supervisory relay serving for complete control of the supervisory lamp for each cord. When the cut-off relay operates it shunts out one of its windings, leaving the circuit resistance so distributed that the subscriber's line becomes a shunt of the supervisory relay, causing this latter to fall back and extinguish the lamp whenever this shunt is closed, this corresponding to the talking position of the switch hook. The shunt is opened with the depression of the switch hook.

In a second of these patents, a line relay is provided and a cut-off relay is placed in series with one limb of the line. The cut-off relay is equipped with a copper shell, or a non-inductive shunt, to reduce its impedance from the line circuit. The supervisory relay is double wound and is of the two-stage type. The first stage corresponds to the insertion of the plug in a jack. This action serves to light the supervisory lamp. The complete operation to the second stage occurs with the removal of the subscriber's receiver, through the energization of the second winding of the supervisory relay. In this position the supervisory lamp is extinguished.

In another of the systems a double-wound line relay is used with a battery tap through suitable retardation at a common point of the two windings. One of the windings is connected with the jack circuit and one with the windings to the line circuit. With a plug inserted the windings act differentially, causing the line lamp to become extinguished.

Another of the patents deals with a triple-wound cut-off relay inserted in the line circuit, the two talking limbs being led through differentially associated windings, one of which acts independently, with a third winding to cause a differential action of the cut-off relay.

In still another scheme the supervisory relay is omitted from the cord circuit, and its equivalent, in the form of a double-wound line relay, is included in the line circuit, the control of the line lamp being a double-wound, differentially connected cut-off relay.

One of the patents includes a double-wound, two-stage supervisory relay, with two-strand cord and plug, but with a three-wire jack circuit, the sleeve of the jack being connected to ground through the cut-off relay winding. In this system the first stage of the relay corresponds to the normal current through one winding of the supervisory relay and the cut-off relay in series. The second stage, with lamp out, corresponds to the talking condition.

A polarized supervisory relay, with tilting armature, is used in another system, in which the normal leakage current through the cut-off relay serves to tilt the armature from the normal position to that closing the lamp contact, while the removal of the subscriber's receiver causes a preponderance of magnetization in the other direction, causing the extinguishment of the lamp.

In two of the systems use is made of double-wound supervisory relays in which the windings act differentially, so that the energization of one illuminates the supervisory lamp, while the energization of both causes it to go out.

The busy-test circuit is designed with the idea of rendering an accidental crossing of one of the cord pairs of no effect on the busy-test relay. This latter relay is of high resistance and is normally connected to all non-busy cords, being removed with the actuation of the calling supervisory relay. The problem, therefore, is so to arrange the cord circuit that when any accidental crossing occurs the corresponding supervisory relay will immediately operate to disconnect the test relay. An added feature is the simultaneous display of a lamp to indicate the faulty cord pair.

CALL-REGISTER SYSTEM.

A call-register system has been patented by Mr. D. S. Hulfish, of Chicago, and assigned by him to the American Telephone & Telegraph Company. This register is arranged for operation in connection with automatic or semi-automatic telephone systems, the register being set for operation with the completion of a connection, but failing to operate until the actual response of the called party. Having once operated, the register locks itself against further action until the complete severing of this connection.

TELEPHONE REPEATER.

A telephone repeating generator forms the subject of a patent granted to Mr. M. R. Gilson, of Philadelphia. The generator comprises a small machine with both internal and external field magnets, a ring armature being driven between them by a pulley and belt. Mr. Gilson finds that such a generator will put a disturbing hum on a line due to the action of the commutator unless the residual magnetism of the fields be counteracted, leaving them neutral except for the magnetizing effect of the received telephone current, which is received upon the field magnet winding. To overcome the residual magnetism a depolarizing permanent magnet is associated with the repeating generator in a manner such that it may be adjusted to reduce the residual magnetism of the generator fields to zero, keeping them in perfect balance, and, therefore, susceptible to the minute received telephone currents. The action of this generator is as follows: The received telephone currents, being impressed on the field magnet of the generator, vary the flux through the armature correspondingly, and the armature, being driven at a constant speed, sends out additional energy to the telephone line corresponding in value at each instant to the instantaneous value of the received current.

MISCELLANEOUS.

An extension bell device has been patented by Mr. A. R. Marcotte, of Concordia, Kan., which consists of a contact push-button with a latch device upon its end. This will engage the magneto-bell rod when depressed, but will be released whenever the rod vibrates. Of course, it will be understood that pushing down this button opens the extension-bell circuit, while releasing it closes it.

Two receiver-holders for desk-stand use have recently been patented. One is of bent wire, the invention of Mr. B. E. Detrick, of New Albany, Ind. This controls the switch hook according to its position of use or rest. The other has a latch for locking the switch hook, and is the invention of Mr. C. R. Schafer.

LETTER TO THE EDITORS.

American Telegraph Engineering.

To the Editors of Electrical World:

SIRS:—I note that an editorial in your issue of Aug. 26 on the subject of the Budapest telegraph and telephone conferences contains the following statement:

"Our telephone systems are second to none in the world, largely because engineering talent has been amply employed in their development; but our telegraph systems are much behind the times, and are yearly growing relatively worse, largely for the corresponding reason that so little engineering talent is nowadays here employed in telegraphy."

This statement is extremely uncomplimentary to American telegraph engineers, and should not go unchallenged.

It is true that the telephone companies in this country have made wonderful advances; but direct comparison of telegraph and telephone equipment does not show the telegraph to be lacking in progressive efficiency.

Perhaps the writer of this editorial had in mind the failure of American telegraph companies to adopt extensively methods of transmission that more fully utilize the carrying capacity of the wires. But I have heard no one contend that the so-called "high-speed" telegraphs have any other merit than cheapness. We do not consider them even cheap, nor do they expedite the handling of traffic so far as the customer is concerned.

In the minds of intelligent men who are informed upon the subject there can be no question that the methods we have selected have greatly advanced and are steadily improving the service. Although there have been no striking changes in the methods of transmitting telegrams (except the printer experiments), there has been great improvement during the past few years in apparatus and equipment.

Speaking solely for my own company, I know that our pole lines will bear comparison with telephone lines, and that our interior equipment is as well suited to telegraph work as the highest grade of telephone equipment is suited to telephone work, and that it will compare favorably with any telephone or telegraph equipment on the face of the earth.

In short, the telegraph system that I represent is not "behind the times" and is not "growing relatively worse," and its telegraph engineers are entirely competent and progressive, and, to say the least, are quite as talented in their own line of work as the engineers of any other wire-using company.

NEW YORK. CHAS. P. BRUCH.

Vice-President Postal Telegraph-Cable Company.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Abstracts of the important articles appearing in the electrical periodical press of the world

Generators, Motors and Transformers.

Multi-Speed Motor.—An illustrated description of a new five-speed and six-speed, three-phase motor of the Oerlikon Company, based on different arrangements of the poles. The stator is wound with three different windings, the supply current having a frequency of 42 cycles per second. Allowing a certain percentage for slip, speeds of 210 r.p.m., 420 r.p.m., 630 r.p.m., 840 r.p.m. and 1260 r.p.m. are obtained with a number of poles equal to 24, 12, 8, 6 and 4, respectively. Two of the stator windings are available for two different numbers of poles having a ratio of 1:2. They are for this reason composed of elementary windings which are distributed regularly over the periphery and are divided into $6.\frac{p}{2}$ groups, where p is the minimum number of poles. These are connected in parallel when the number of poles is p, and in series when the number of poles is $2p$. The third winding is used only for a single number of poles. All three sets of windings are embedded in the same stator slots, the windings corresponding to 12 or 24 poles being placed nearest the gap, then the windings for four and eight poles, and, lastly, the windings for six poles are placed at the bottom of the slot. The output of the motor is 1260 r.p.m.—that is to say, with four poles is 23 hp when the terminal pressure is 280 volts. Naturally, the output decreases

with the speed and is only 6 hp when the motor is running under the 24-pole condition. The rotor winding is of the squirrel-cage type, and is composed of bars embedded in slots and connected at their ends by a short-circuited ring of brass. The pole-changing arrangement employed requires 15 terminals, six of which are intended for each of the two windings that provide two sets of poles, and three for the six-pole winding. By means of this motor several tests on a new method of

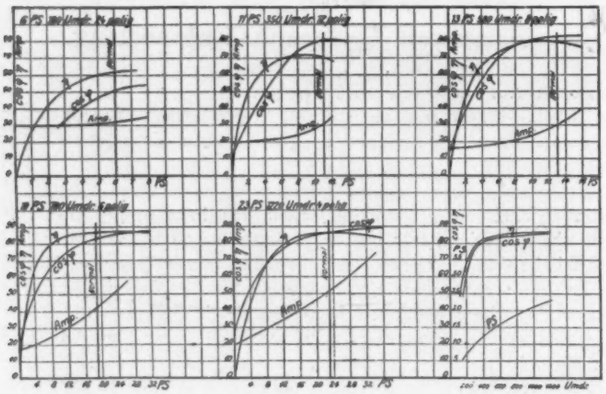
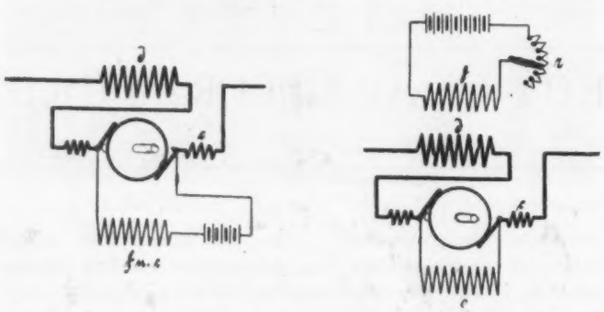


FIG. 1.—CHARACTERISTIC CURVES OF THREE-PHASE MOTOR.

pole-changing have been made possible. This arrangement allows a single winding to be arranged so that three different numbers of poles are obtainable from it in the ratio of 4:6:8 or 6:8:12. For this purpose the winding, which is designed to give 4:6:8 poles, is divided into 6. $\frac{p}{2}$ groups of elementary windings, the beginning and end of each group being connected to a terminal. Twenty-four terminals are thus necessary for winding giving four, six and eight poles. The distribution of the winding over the periphery is symmetrical both for poles and phases. On the contrary, for six poles the elementary windings are distributed irregularly. Under the first pole face, phase one has two windings in series and phases two and three one single winding only. Under the next pole, phase two has two windings and the other two have only one, and so on, but eventually each phase contains the same number of windings. The subdivision of the windings for 12, 16 and 24 poles is similar to that with 4, 6 and 8 poles, there being 36 poles with 72 terminals. Fig. 1 shows the operation at 260 volts, with a frequency of 42 cycles and using five speeds with three windings. In the illustration *P S* means horse-power, *Umdr* means revolution per minute, and *24-polig* means 24 poles. Results of tests of the motors as a six-speed motor at 280 volts with a frequency of 50 cycles are also given. The six speeds are obtained in this case with 24, 16, 12, 8, 6 and 4 poles.—Lond. *Electrician,* Aug. 27.

Constant-Current Machine.—C. Kraemer.—An illustrated de-



FIGS 2 AND 3.—DIAGRAMS OF CONSTANT-CURRENT MACHINE.

scription of a new constant-current machine of the Felten & Guilleaume-Lahmeyer Company. If a machine is excited by a series winding *J* (Figs. 2 and 3) and if this field is exactly compensated by a separate exciting coil *f*, every change of current is accompanied by a change of voltage. "This change of voltage can be used to introduce a self-excitation in another winding *e*, whereby with constant external resistance the current is brought back to the value corresponding to the separate excitation, since the self-excitation *e* replaces the field originally produced by the current change." There is, therefore, a sum of three fluxes. The self-excitation coil *e* and the separate-excitation coil *f* are either connected in series (Fig. 2) or in different circuits (Fig. 3). *c* represents compensation poles.

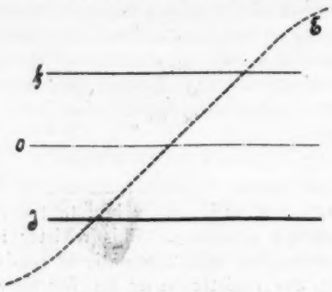


FIG. 4.—RELATION OF FLUX AND EXCITATION.

In Fig. 4 the line *f* represents the flux produced by the separate-excitation coil *f*, line *J* the flux produced by the main current, and the dotted line *E* represents the self-excitation, which depends on the voltage at the terminals of the machine. The sum of *J* and *f* must always be exactly zero. All three windings are placed together on the poles of the machine, which is otherwise of ordinary normal design. Since the sum of *J* and *f* must be exactly zero, it follows that the main current depends on the value of the separate excitation *f*, which may be adjusted by means of the rheostat *r* in Fig. 3. To prevent sparking the machine may be provided with compensation poles *c*. The machine is so adjusted that with constant current the voltage is automatically regulated according to the external resistance. The author describes applications of this machine in connection with the Ilgner hauling system, for rolling mills, as a booster for charging storage batteries, for arc-lamp circuits, etc. Since its design is exactly that of any standard machine, it is as reliable and sparkless in service as any standard direct-current machine.—*Elek. Zeit.,* Aug. 26.

Leakage Reactance.—J. Rezelman.—The conclusion of his illustrated mathematical article in which the author deals with the leakage reactance of the stator windings of alternating-current machines, the rotors being removed. The leakage flux is separated into its component parts, for several machines, by means of experiments; the effect of the type of winding upon the end-turn leakage and the relationship between the reactance of the windings in three-phase and in single-phase working are observed. Forumlas are given by means of which the stator reactance can be calculated.—Lond. *Electrician,* Aug. 27.

Speed Control of Induction Motors.—H. C. Specht.—The author discusses nine specific examples of the application of induction motors in cascade connection in comparison with single multi-speed induction motors.—*Elec. Journal,* August.

Direct-Current Motors.—F. B. Crocker and M. Arendt.—A continuation of their article, discussing motor losses, the rating of motors, and methods of controlling the direct-current series motors.—*Gen. Elec. Review,* September.

Transformers.—M. O. Troy.—The conclusion of his article on constant-potential transformers. The author discusses special steels for transformers and transformer constructions, and makes some remarks on judging a transformer with regard to its safety (durability, heating and insulation) and annual costs of operation.—*Gen. Elec. Review,* September.

Lamps and Lighting.

Metallic-Filament Lamps.—A. Libesny.—The conclusion of his paper before the German Association of Electrical Engineers on the development of the metallic-filament lamp during the last year. Fig. 5 gives curves showing the life of Osram lamps as a function of the specific consumption in watts per hefner candle. The ordinates are hours, the abscissas watts per hefner candle. The curve *ABS* gives absolute life, the curve

marked 20 per cent gives the useful life at the end of which the candle-power is decreased by 20 per cent of the original value. The curve marked 10 per cent gives the useful life at the end of which the candle-power is decreased by 10 per cent of the original value. For instance, when operated at 0.7 watt per hefner candle, the absolute life is 115 hours, while at the end of 48 hours the candle-power is 90 per cent of the original value, and at the end of 81 hours it is 80 per cent of the original value. The author then applies his results to the graphical determination of the best conditions under which Osram lamps of present construction and price can be run. The results are given in the following table:

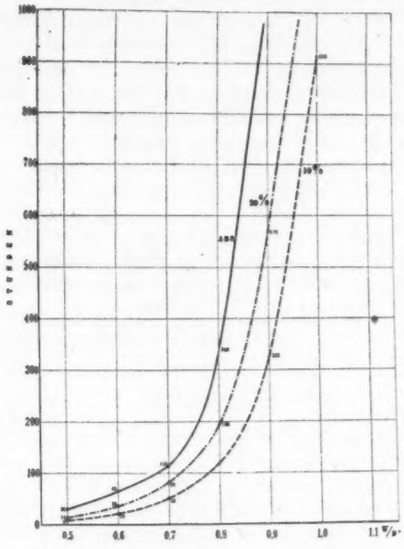


FIG. 5.—LIFE CURVES OF OSRAM LAMPS.

Cost of kw-hour.	Most economical specific consumption.
11.25 cents	1.10 watts per hefner candle
12.5 "	1.05 " " " "
15 "	1 " " " "
25 "	0.95 " " " "
50 "	0.90 " " " "
75 "	0.87 " " " "
100 "	0.85 " " " "
125 "	0.84 " " " "
150 "	0.82 " " " "

It will be seen that even at the enormous and practically impossible price of the energy at $1.50 per kw-hour a 0.7-watt per candle lamp is uneconomical. The net result is that with the present price of energy the most economical operation of Osram lamps relates to a consumption of 1 watt per hefner candle or more. During the last year the manufacturers of metallic-filament lamps have succeeded in extending the usefulness of these lamps to lower and to higher candle-powers. For instance, a 16-cp, 18-watt lamp for from 110 volts to 130 volts is now available. The author believes that the 25-cp lamp will be the lamp of the future, since there is now a demand for more light. For 220 volts a 32-cp, 40-watt lamp has been made. Finally, a high-candle-power lamp has become available in the form of the "intensive" Osram lamp of 600 or 1000 hefner candles measured horizontally. They are not intended to replace arc lamps of the same candle-power for direct current or arc lamps with impregnated carbons, but they can compete economically with alternating-current arc lamps with carbon electrodes. These intensive Osram lamps are also intended for indirect illumination in schoolrooms, drawing-rooms, etc.—*Elek. Zeit.*, Aug. 26.

Tungsten Lamps.—A. BERINGER AND R. SCHUSTER.—An account of life tests of 23 tungsten lamps. The mean ratio of the mean spherical candle-power to the mean horizontal candle-power is 0.734, this being the ratio of the means of the two candle-powers for 1000 hours. The mean useful life at the end of which the candle-power is decreased by 20 per cent of the original value was 1044 hours. The following figures show the comparison of carbon, osmium and tungsten lamps.

	Carbon	Osmium	Tungsten
Mean watts per spherical hefner	4.171	2.145	1.353
Useful life in hours	707	1242	1044
Mean watts per horizontal hefner	3.411	1.662	1.026
Useful life in hours	681	1242	1044

Osmium lamps are no longer made; they represent merely a stage in the development of the metallic-filament lamp. The total cost of lighting with osmium lamps and with tungsten lamps is cheaper than with carbon lamps by 45 per cent to 70 per cent, respectively.—*Zeit. f. Beleucht.*, Aug. 20.

Tungsten Lamp.—A note on a recent British patent (5821, 1909; Aug. 19, 1909) of the British Thomson-Houston Company (General Electric Company of this country). The higher oxides of the refractory metals are reduced to the lower oxides by heating them to a temperature of 800 deg. C. in graphite crucibles enclosed in carbon packing. Thus, if the yellow tungsten oxide WO_3 is treated in this way the air produces CO by action on the carbon packing, and this reduces the WO_3 to WO_2, forming CO_2. The CO_2 and the carbon packing react to form CO, which continues the reduction of the WO_3. The brown oxide WO_2 produced is made up into a squirting mixture.—Lond. *Elec. Eng'ing*, Aug. 26.

Generation, Transmission and Distribution.

Building Slip Equipments.—H. H. BROUGHTON.—An illustrated article in which the author sets out the essentials which have to be embodied in the crane equipment of a building slip. The most widely used equipments are those in which either cantilever cranes, overhead traveling cranes, overhead wire cableways, gantry cranes or fixed or portable tower cranes are used. It is believed that the overhead-crane system most nearly satisfies the requirements of yards turning out the largest ships, and particulars of three equipments, which have been installed at Messrs. Beardmore's, Harland & Wolff's, and Krupp's, are here given.—Lond. *Electrician*, Aug. 27.

Saw Mills.—G. U. BORDE.—An article claiming that almost any saw mill in this country is operated wastefully. The advantage of the electric drive is pointed out, with individual electric motors driving each piece of machinery separately. Reference is made to the manufacture of ethyl alcohol from sawdust.—*Gen. Elec. Review*, September.

Crane.—F. NIETHAMMER.—A detailed illustrated description of a three-motor traveling crane for 30 tons.—*Elek. und Masch.* (Vienna), Aug. 22.

Machine Tools.—A. COMET.—Illustrated descriptions of electrically driven machine tools.—*La Lumière Elec.*, May 8, June 19 and 26, Aug. 7 and 21.

Condensers.—F. HODGKINSON.—A continuation of his illustrated article on "the choice of a condenser." The author begins to discuss different types of condensers, and deals in the present instalment with surface condensers.—*Elec. Journal*, August.

Traction.

Lyons.—An illustrated description of the overhead construction and rolling stock of two single-phase, 6000-volt suburban extensions of the direct-current tramway system of Lyons, in France. All poles are of steel, and single catenary construction is used throughout.—*Elec. Rail. Jour.*, Sept. 4.

Installations, Systems and Appliances.

High-Tension Interrupters.—HENRY.—In a continuation of his long illustrated article on high-tension interrupters he describes numerous types. After some general notes on interrupters for e.m.fs. up to 1000 volts, and on oil interrupters, descriptions are given of various high-tension interrupters of the Westinghouse Company, Siemens-Schuckert Company, Allgem. Elek. Ges., Thomson-Houston Company, Oerlikon Company, General Electric Company, Hartman, and Kelman. The article is to be continued.—*L'Industrie Elec.*, Aug. 25.

Rheostat Control.—A. E. BUTTON.—A second article on fundamental principles of rheostat control. The author discusses speed regulating rheostats with direct-current motors.—*Gen. Elec. Review, September.*

Wires, Wiring and Conduits.

Calculation of Lines.—A. BLONDEL.—The first part of an

article in which the author gives, for the case of lines with no capacity, simple graphical solutions of different problems. He gives, especially, a set of logarithmic curves which permit one to read off directly the diameter of conductors required for a given voltage drop.—*La Lumière Elec.*, Aug. 28.

Insulation of Wire.—A note on a recent British patent of P. MacGahan (23,007, 1908; Aug. 19, 1909). The copper bar to be drawn into wire is given a coating of aluminum before rolling. The wire drawn from this has thus a very thin coating of aluminum, and if it is passed through an electrolytic bath containing ammonium borate or other suitable solution, a thin film of aluminum oxide (which is a good insulator) will be formed. The metals need not necessarily be copper and aluminum.—Lond. *Elec. Eng'ing*, Aug. 26.

Electrophysics and Magnetism.

Atomic Theory.—E. Rutherford.—His address to Section A of the British Association for the Advancement of Science. While formerly it has been thought that the atomic theory would always remain an hypothesis unverifiable by direct methods, some new direct methods have been found in recent years. They have to do partly with the Brownian movements. "The character of the Brownian movement irresistibly impresses the observer with the idea that particles are hurled hither and thither by the action of forces resident in the solution, and that these can only arise from the continuous and ceaseless movement of the invisible molecules of which the fluid is composed." Recent experiments of Terrin strongly confirm this view. Further, the behavior of the alpha particles of radium gives a direct method of determining the mass of each particle, its charge, and its velocity, while the general evidence indicates that the alpha particle is a charged atom of helium. From a great many different experimental and theoretical investigations, it may be concluded that the number of molecules in a cubic centimeter of any gas at standard pressure and temperature is about 2.77×10^{-19}, and that the value of the fundamental unit of quantity of electricity is about 4.65×10^{-10} electrostatic units. There has been a tendency in some quarters to suppose that the development of physics in recent years has cast doubt on the validity of the atomic theory of matter. This view is quite erroneous, for it will be clear from the evidence already discussed that the recent discoveries have not only greatly strengthened the evidence in support of the theory, but have given an almost direct and convincing proof of its correctness. The chemical atom as a definite unit in the subdivision of matter is now fixed in an impregnable position in science. Leaving out of account considerations of etymology, the atom in chemistry has long been considered to refer only to the smallest unit of matter that enters into ordinary chemical combination. The advent of the electron has shown that the atom is not the unit of smallest mass of which we have cognizance, while the study of radio-active bodies has shown that the atoms of a few elements of high atomic weight are not permanently stable, but break up spontaneously with the appearance of new types of matter. These advances in knowledge do not in any way invalidate the position of the chemical atom, but rather indicate its great importance as a subdivision of matter whose properties should be exhaustively studied.—Lond. *Electrician*, Aug. 27.

Law of Induction.—F. Emde.—A theoretical article giving some supplementary notes on the current formulation of the law of induction.—*Elek. und Masch.* (Vienna), Aug. 22.

Electrochemistry and Batteries.

Tests of Iron.—M. E. Rice and B. McCollum.—A description of a new method of testing iron using an electrodynamometer specially designed for ballistic work and having a rather long period of swing. The ballistic dynamometer may be used for determining both the hysteresis loss per cycle and the permeability of a sample of iron, thereby requiring only one set of apparatus for both purposes. Or, the regular ballistic galvanometer method may be used for determining the permeability curve. The sample of iron to be tested should be laminated; laminations of ordinary commercial thickness being entirely satisfactory. The laminæ should be separated by sheets of paper to insure that any slight eddy current loss will not be unduly increased by conduction from one sheet of iron to the next. The laminæ may be cut into the form of closed rings, and a number of them assembled and wound by hand, the magnetic circuit in this case being a closed one; or they may be cut into the form of half rings and a number of them inserted into ready wound magnetizing and test coils, the magnetizing circuit in this case having short air-gaps in it. The latter arrangement, while not satisfactory for determining the true permeability curve, is, however, commercially as good for determining the hysteresis loss per cycle and the corresponding value of the maximum magnetic flux density. It has, in addition, the advantage of enabling many different samples of iron to be tested in a short time when the apparatus has once been set up. To measure the hysteresis loss per cycle, the circuits

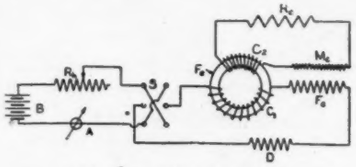


FIG. 6.—TESTS OF IRON.

are arranged as shown in Fig. 6. The iron ring *Fe* is magnetized by any desired current, which can be adjusted by the battery *B* or by the rheostat *Rh*, or by both. This current flows in series through the ammeter *A*, the rheostat *Rh*, the reversing switch *S*, the magnetizing coil *C*, the choke coil D and the fixed or field coils *Ee* of the electrodynamometer. The secondary or test coil C_2 is connected in series with a resistor *Re* and the movable coil *Mc* of the electrodynamometer. Reversing the switch *S* will cause a ballistic deflection in the dynamometer, which deflection may be read by a telescope and scale in the usual way. The energy loss per cycle in the iron, corresponding to a certain magnetizing current, is proportional to the deflection of the dynamometer. For determining the maximum magnetic flux density by the dynamometer method, the circuits are arranged as shown in Fig. 2. In the field coils *Fe* of the

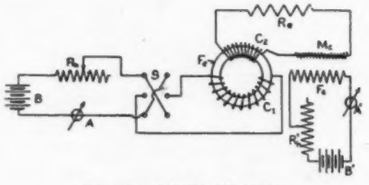


FIG. 7.—TESTS OF IRON.

dynamometer a separate steady current *I"* is maintained, adjusted to a suitable value by the rheostat *Rh'*. Reversing the magnetizing current by means of the switch *S* gives a deflection in the dynamometer as in the case of an ordinary ballistic galvanometer. The value of *B* of the maximum magnetic flux density, corresponding to any magnetizing current, is proportional to this deflection. The theory of the method is given, together with a numerical illustration, followed by comparative results showing the degree of accuracy attainable in practice.—*Phys. Review*, August.

Measurement of Short Electric Waves.—H. W. Webb and L. E. Woodman.—An account of a systematic study of vibrators and receivers for short electric waves. Wave-length determinations for short electric waves should be made with a non-selective receiver. Measurements depending upon tuned receivers are liable to errors arising from the process of tuning, which in general is very unreliable. A non-selective receiver may be obtained by using a Klemencic receiver of 10 or more times the resonance length. If the relative dimensions of a vibrator or of a receiver are maintained constant, the corresponding wave-length is directly proportional to the dimensions. Hence standard forms of vibrators and receivers may be selected, for which the dimensions may be easily computed for any desired wave-length, if one knows from experiment the

wave-length corresponding to any one size. The authors investigated such a vibrator and receiver and determined their properties. The wave-length emitted by a cylindrical vibrator of given length depends upon the extent and properties of the dielectric at the center, and the ratio of the diameter to the length, but not upon the nature of the metal, nor upon the length of the air-gaps. The length of the oil-gap, if small, was found to have little influence on the emitted wave-length. The wave-length corresponding to a Klemencic receiver of given length depends upon the extent and nature of the dielectric at the center, the width and thickness of the antennæ, or wings, and the length of the constriction at the center. A linear relation was obtained between the wave-length and the dimensions of a modified Righi vibrator.—*Phys. Rev.*, August.

Temperature Errors in Meters.—A note on a recent British patent of G. Hookham (15,802, 1908; Aug. 19, 1909) for a method of eliminating temperature errors in meters. The temperature error in mercury and other meters is compensated for by arranging a shunt-resistance wire in a chamber in such a way that when the temperature increases, mercury rises in the chamber and alters the effective length of the wire. The wire is provided with amalgamated kinks at intervals to make good contact with the mercury; movement of the mercury column is effected by the expansion of oil.—Lond. *Elec. Eng'ing*, Aug. 26.

Telegraphy, Telephony and Signals.

Telephone Circuit.—PIRRO.—The first parts of a mathematical paper in which the author calculates the distribution of potential and current in a non-uniform telegraph or telephone circuit. With the term "non-uniform" the author means a circuit which comprises, for instance, overhead sections and underground cable sections, apparatus inserted at different points, connections to transformers, etc. The article is highly mathematical.—*La Lumière Elec.*, Aug. 21 and 28.

Miscellaneous.

United States and England.—J. S. CONOVER.—An article explaining some of the differences between English and American practice in electrical engineering. In England a regulation requires practically all electric lighting wires in cities and towns, large and small, to be placed underground. In England most of the towns were provided with a gas plant and distributing systems before the event of electricity into the lighting field. A large majority of electric lighting plants in England are owned by municipalities, which also own the street-railway systems. In smaller towns combined lighting and railways stations are favored; there is, therefore, a demand for direct-current generators which will give from 460 volts to 480 volts as shunt machines, and which are provided with series-field coils so that they will give from 500 volts to 550 volts when operated as compound-wound machines. The system of street lighting generally used in England is the series-multiple—that is, two, lamps in series on 220 volts, or four in series on 440 volts, or the straight multiple. In America practically all the house-service meters are watt-hour meters; in England nearly all direct-current house-service meters are amp-hour meters. The English demand for incandescent lamps has been primarily for voltages between 220 and 240, with the bayonet type of base. With the new metallic-filament lamps this high voltage presents great difficulties. The total yearly sale of incandescent lamps in America at the present time is estimated to be about 60,000,000, whereas in England, with a population approximately one-half as great, the total yearly sale probably does not exceed 15,000,000. On street railways the maximum speed permitted in England is about 12 miles per hour, and in America about 25 miles. Moreover, in England there is a regulation that the drop in voltage in the return circuit shall not exceed 7 volts. This regulation has made the use of track boosters quite common, and even with these boosters the cost of return cables becomes a serious item on lines extending into the suburbs. The usual type of street car in England is double-decked with seats on top. In England competition in most lines of manufacture is very keen, and profits are generally smaller than in America. The difference in conditions between the two countries extends even into the field of renewal parts. A characteristic of the English is their ability to make things last a long time and to continue to give good service. The English market can be classed as a very restricted one as compared with the American market.—*Gen. Elec. Review*, September.

BOOK REVIEW.

CONGRÈS INTERNATIONAL DES APPLICATIONS DE L'ELECTRICITÉ, MARSEILLES, 1908. Publié par les soins de H. Armagnat, rapporteur general. Paris: Gauthier-Villars. Three volumes, 709, 737, 553 pages, illustrated. Price, 68 francs.

These three portly volumes of 2100 pages, which in typographical execution are worthy of the great publisher whose imprint they bear, give the proceedings of an international electrical congress that unlike previous similar bodies, dealt almost entirely with practical electrical engineering. It would be impracticable to give here a complete list of the subjects dealt with, which included, among others, insulation, overhead construction, high-efficiency illuminants, the electric drive, electric heating, control and regulation, protection against accidents, electric tractors and canal haulage, fixative of nitrogen, central-station rates, electrochemistry and electrometallurgy, telegraphy, telephony, electrical measurements, electrical laboratories, cement poles, photometry, wireless telegraphy, engineering education, etc. Some of the topics formed the subject of two or more papers, and many of the contributions were followed by interesting discussions.

A paper by Prof. Blondel, on "What Should an Electrical Engineer Be?" formed one of the most important contributions to the congress, and led to a long and animated discussion. In the course of the paper Prof. Blondel classified electrical engineers as designing and constructing engineers, operating engineers, consulting engineers, electrochemical engineers and commercial engineers. He entered at length into the subject of technical education, and declared himself opposed to specialization at schools, though favoring professional specialization based upon a solid general technical course of instruction. The paper, with the lengthy discussion which followed, presenting various national views on the subject, forms one of the most important contributions thus far made to the subject of the training of the electrical engineer. Another interesting and lengthy educational paper was presented by Prof. Paul Janet and M. Chaumat, giving an account of the organization and courses of instruction of a large number of the leading electrotechnical schools of the world.

At the formal closing session of the congress a number of recommendations presented by the chairman of sections were adopted. Among these were that non-treated wooden poles should not be used where electrical circuits cross a public way or railroad line; that the Electrotechnical Commission be requested to take under consideration the formulation of a code of international standardization rules; that electric motors, in addition to the standard test, should be submitted to another of a duration having a relation to the service in which it will be used; that government regulations shall require the application in case of electrical accident of the method of the resuscitation by artificial respiration and rhythmic manipulation of the tongue, which shall be continued over a long period, or until the arrival of a physician. Mr. C. O. Mailloux offered a resolution proposing a permanent international electrical congress organization, and the present appointment of national committees to report on the subject to a provisional committee. The resolution was unanimously adopted and the provisional committee appointed.

The U. S. Government was represented at the congress by an army and a navy officer, and the American Institute of Electrical Engineers by Messrs. C. O. Mailloux, of New York, and R. O. Heinrich, of Berlin. Mr. Mailloux was a member of several of the important committees and sections, and took a leading part in the work of the congress.

NEW APPARATUS AND APPLIANCES

Sewing-Machine Motor.

The Bissell Motor Company, of Toledo, Ohio, has brought out a sewing-machine motor which possesses many features of interest. The motor can be applied to any machine on the market, occupying the space taken by the hand-wheel, which it replaces. Eight operations suffice to place the motor in position ready for operation. First, the hand-wheel is removed from the machine; then the bobbin winder, after which the end motion of the sewing-machine shaft is taken up by means of a collar. The motor is then slipped into position on the shaft and locked by means of a wrench, which accompanies the outfit. A leather cord from the rheostat beneath the motor is next attached to the treadle of the machine and one end of the conducting cord, which is furnished, is attached to any nearby incandescent-lamp socket, the other end being connected to the motor. The machine starts by a slight pressure of the toe on the treadle, and when the latter is pressed harder the speed is increased. The instant the foot is released the motor stops, owing to the operation of a brake. Two types of motors are built: one for direct-current circuits of 100 volts to 125 volts, and the other for alternating-current circuits having frequencies of 25 cycles to 60 cycles and voltages ranging from 100 to 125. The motor is not much larger than the hand-wheel which it replaces.

The operation of removing the hand-wheel varies slightly with different machines, but definite instructions are sent for standard makes; the same is also true of the other operations. Not all sewing-machines run in the same direction, so the motor is made easily reversible. The reversal of rotation is made by changing the connections under the name-plate and this operation is performed by loosening the screws holding the connecting strips and then changing the strips to a position at right angles to their former position. The motor has five speeds, and there are only three places on the motor requiring oil; one is on the front of the armature and the other two on the bobbin winder. The brushes and commutator are on the side of the motor next the machine, where they are free from accidental mishap. The motor is rugged in construction, and complete instructions are furnished by the maker so that it is not necessary for one to know anything about electricity in order to attach and operate the machine.

GENERAL VIEW OF MOTOR, SHOWING METHOD OF RAISING NEEDLE.

Flaming-Arc Window Lighting.

The Charles L. Kiewert Company, of Milwaukee, Wis., which markets a number of flaming and other arc lamps, has made an installation of street and window lighting of interest. The store illustrated in Fig. 1 was opened for business in February of this year. The white tile front is illuminated by two "Aurola" flaming-arc lamps using electrodes giving a white light, and the resulting effect is distinctly noticeable some distance away. The show window itself is illuminated in a very novel manner. A "Trucolor" arc lamp with electrodes giving a white light is suspended above the window as indicated in Fig. 2. A prismatic hemisphere diffuses the light over a large surface so as to decrease the intrinsic brilliancy. The onlookers can thus readily distinguish colors and are not disturbed by glaring light. The color value of the light is said to be such that the shades and the fabric do not suffer distortion.

FIG. 1.—FLAMING ARCS IN FRONT OF STORE.

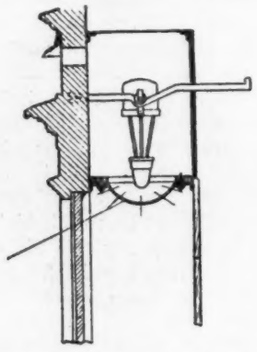


FIG. 2.—ARRANGEMENT OF LAMP FOR WINDOW LIGHTING.

Series-Multiple Direct-Current Arc Lamp.

The Westinghouse Electric & Manufacturing Company, which has been active in perfecting the series-multiple direct-current arc lamp, has recently brought out a new form of this type. The lamp is self-contained, having no external resistance that ordinarily must be mounted separately from the lamp. The

FIG. 1.—SERIES-MULTIPLE ARC LAMP.

mechanical development has been in the direction of simplification and the reduction of the number of parts, yet producing a lamp that is automatic and reliable in its operation.

The moving parts of this lamp are made of solid brass, and

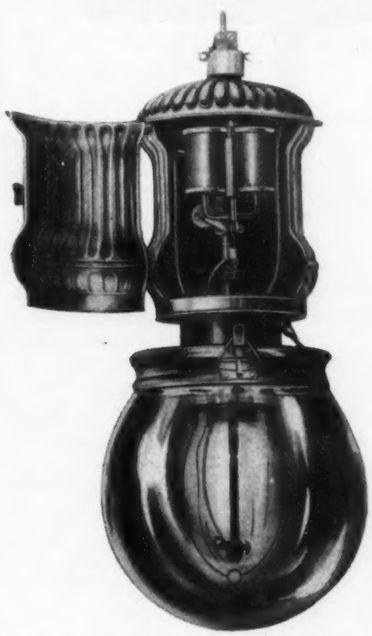


FIG. 2.—MECHANISM OF SERIES-MULTIPLE LAMP.

will not rust and stick as iron parts do. Other details of construction are correspondingly strong and durable, the insulation being fireproof, and the circuits so arranged that the points of potential stress are few and well spaced. The lamp is made in sections of sheet copper pressed into a fluted form with lines pleasing to the eye. One-third of the case can be swung open, making the mechanism readily accessible. This feature, together with the small number and durable nature of the working parts, tends to lower maintenance costs.

The characteristics of primary importance—prompt and silent starting and steady burning—have been successfully attained in this type of lamp. Since best results are obtained with an 80-volt, 5-amp arc, the lamp resistance is made adjustable so that the lamps may be connected two in series on 220-250-volt circuits, or five in series on 500-550-volt circuits.

These lamps are designed for operation in series groups, and if for any reason one lamp has its arc broken, an automatic cut-out switch short-circuits the mechanism protecting the shunt coils and inserting an equivalent resistance, which enables the other lamps in the group to operate normally. It is claimed that the small energy consumption, together with the superior quality and great quantity of light, makes this lamp a close competitor of the flame arc in places where either may be used, and the comparison grows more favorable when the small up-keep is considered, the carbon life being 125 hours to 175 hours per trim.

Intensified Arc Lamp.

For years the enclosed arc lamp has been greatly in favor for general mercantile lighting by virtue of the color of the light, low maintenance cost and efficiency. By a radical change of design, the General Electric Company has brought out an intensified arc lamp which maintains the special points of superiority possessed by the enclosed arc lamp and has other advantages. Two upper or positive carbons, 6 mm in diameter and 305 mm in length, are placed in converging tubes, so that the ends of the carbons are in contact. A self-acting weight, bearing down on the top, prevents one carbon from being consumed faster than the other. One lower or negative carbon is used, 9.5 mm in diameter and 100 mm in length. The lower carbon holder is movable in a vertical direction, being attached to a counterweight mechanism through which the action of gravity tends to hold it in contact with the upper car-

FIGS. 1 AND 2.—INTENSIFIED ARC LAMP.

bons. The magnets, acting through a clutch on a rod of the counterweight mechanism, draws the lower carbon downward away from the upper ones. In this way the magnets cause the carbons to strike and maintain the arc, keeping the lower carbon floating at the point of electrical equilibrium.

When an arc is formed, the current density is much greater at the carbon tips than in the case of the standard enclosed lamp; and as the resultant heat cannot be readily dissipated, the carbon tips pass beyond the usual red-hot poker stage to

the incandescent or white-hot stage. In order to obtain the highest efficiency possible, a small diffuser is used, located directly above the arc. In this way a greater percentage of light is distributed in the lower hemisphere. The resultant

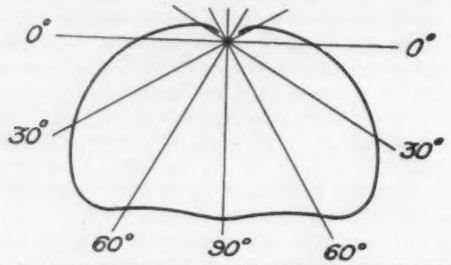


FIG. 3.—DISTRIBUTION CURVE OF INTENSIFIED ARC LAMP.

specific consumption, therefore, is equal to about 1¼ watts per mean hemispherical candle-power at 5 amp and 110 volts direct current.

The distribution of light, as shown in Fig. 3, is excellent for interior illumination, since maximum intensity is obtained in the working plane where most needed. One of the most noticeable features of the lamp is said to be the daylight effect created when in use. The light is of a soft, almost perfect white tone, and is steadily and evenly distributed.

At 5 amp and 110 volts direct current, a carbon life of 75 to 100 hours is claimed. This long life, together with the high efficiency, reduces the maintenance cost to a minimum, so that with the "intensified" arc lamp it is now claimed to be possible to obtain the very best grade of illumination in large interiors at a minimum cost. The lamp is made for either direct-current or alternating-current multiple circuits.

Fig. 1 represents the lamp equipped with ornamental casing. It will be noticed that this lamp differs materially from conventional designs. The outer globe is made of leaded glass to correspond in effect with the casing. The lamp is therefore appropriate for dry goods, clothing and department stores, as it is attractive by day as well as by night, and at the same time meets the requirements of high-grade illumination and minimum cost.

Motor-Starting Panels.

The accompanying cuts show the latest type of Ward Leonard motor-starting panels. The first shows a panel consisting of double-pole switch and fuses and no-voltage release motor-starter with interlocking overload circuit-breaker mounted upon slate. The panel thus comprises all of the necessary apparatus for the proper installation of the motor. Fig. 2 shows a panel having a double-pole circuit-breaker replacing switch and fuses, and a series of steps which are individually operated, the final switch short-circuiting the previously closed switches and opening the main-line circuit upon no-voltage.

FIG. 1.—MOTOR-STARTING PANEL.

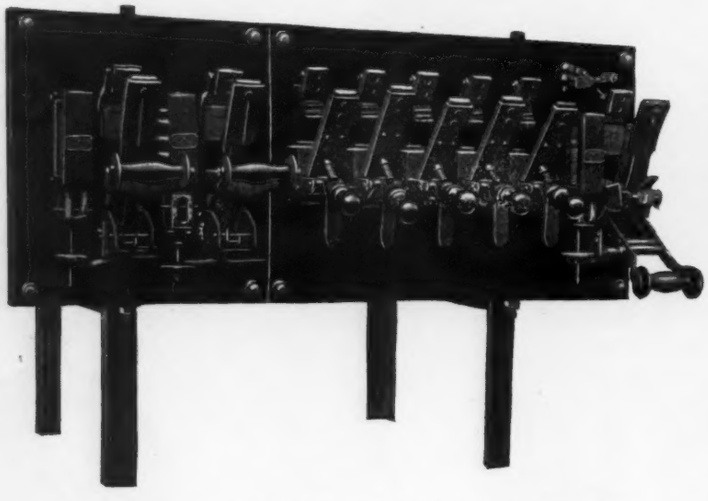
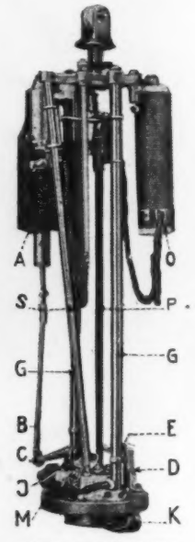


FIG. 2.—STARTING PANEL EQUIPPED WITH CIRCUIT-BREAKERS.

Self-Regulating Flaming-Arc Lamp.

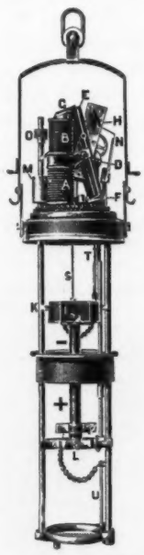
The Regina Arc Lamp Works, Limited, Cologne-Sülz, Germany, manufacture an arc lamp devoid of clockwork or regulating coils. The mechanism of the lamp, which is known as the "Conta," is illustrated herewith. The rods *G* form a guide for the electrode gear, which slides perpendicularly on them. The circuit is formed through the series coil *A*, thence through the blow magnet *M*, the self-contained line resistance, *O*, the movable electrode *S*, across the arc to the clutched electrode and then out through the second terminal. When the coil *A* is energized its iron core causes the rod *B* to lift the lever *C* and actuate the starting slide *J*, thus separating the converging electrode from the clutched electrode and striking the arc. This arrangement of the electrodes does not change during the time the lamp is lighted, and the feed of the electrodes thereafter is said to be regulated automatically. When the clutched electrode, which controls the feed, touches the non-combustible lower arm *K* of the clutch lever, which is pivoted at *D*, the small upper arm *E* of this lever grips the electrode immediately above the lamp plate. So long as a slight weight bears on the arm *K* the lever *E* grips the electrode *P*, but by the progressive consumption of the electrode this brake action on the lever *K* is released until the arm *E* permits the electrode to fall freely so as to rest again on the arm *K* when the lever *E* comes into action. The lamp does not require electrodes of a special shape, ordinary cylindrical flame or pure carbons being employed. The mechanism is separated from the arc chamber and as the electrode guide plates fit the electrodes exactly, and the latter are not subject to any movement, the guide rods are kept free from deposit due to the consumption of the electrodes. The power consumption of the lamp is said to be 0.13 watt per candle-power, and with flame carbons the mean hemispherical candle-power of the smallest type of lamps, which requires 330 watts, is said to be 1600 cp, the manufacturers claiming 5000 cp from their 660-watt lamp. The lamp is applicable for direct-current and alternating-current circuits and for operation singly or in series. When pure carbons are employed a separate resistance is necessary, and the length of burning between trims varies from 14 hours to 16 hours. With ordinary plain carbons it is necessary to trim the lamps every 8 or 10 hours.



SELF-REGULATING FLAMING-ARC LAMP.

Flaming-Arc Lamp for Street Lighting.

The "Santoni-Kosmos" flaming-arc lamp, manufactured by the Globe Electric Company, 11 Farringdon Avenue, London, E. C., England, and illustrated herewith, is a differentially wound lamp of standard design, adapted for the use of highly mineralized carbon electrodes, and provided with ample ventilation to permit the fumes arising from the arc to escape without attacking any of the working parts of the lamp. By reference to the illustration, it will be seen that the regulating mechanism consists of a double horseshoe, series magnet *A* and a double-shunt magnet *B*. The armature frame *E* moves on a shaft *D*, and the series and shunt armatures *F* and *G* depend upon the magnetizing action of the double differential magnets, the feed mechanism being attached to the armature. The negative or upper electrode is inserted in the holder *I*, which is attached to the guide fork *K*, the positive or bottom electrode being fixed to the ball joint *L* by means of which an accurate adjustment is obtained. The holders are suspended by a flexible cord *S*, led over the pulley of the feed mechanism. The dash-pot *M* is attached to the armature frame and feed mechanism. When the lamp is brought into use the circuit is completed through the negative terminal, a bead-insulated wire *T*, the upper electrode and so to the bottom electrode, thence by another bead-insulated wire through the guide rods to the series coil *A* and out at the positive terminal of the lamp. The lamp frame and guide rods are insulated. The shunt windings of the magnets *B* are connected in parallel across the terminals, and when the lamp is switched into circuit the differential magnet *A* attracts the armature *F*, and the feed mechanism, being coupled to the armature frame, draws the electrodes apart and thus the arc is struck. As the voltage increases the shunt magnet *B* attracts the armature *G* into its lowest position, permitting the ratchet gear of the feed mechanism to act in accordance with the requirements of the arc. Adjustment is secured by loading the dash-pot with lead washers *O* according to requirements. The construction of the lamp is said to make its burning independent of the weight of the electrodes, and the gravity feed is claimed to insure a regular and steady arc. The potential across the arc ranges from 30 volts to 33 volts, so that three lamps may be connected in series on 110-volt circuits. The electrodes employed have a large, highly mineralized carbon core, with a thin outer casing of carbon, and being placed in a vertical position the horizontal projection of the light makes the lamp suitable for illuminating streets, squares and large open spaces.



SANTONI-KOSMOS FLAMING-ARC LAMP.

Bituminous Producer in Double Role in Sheet-Metal Factory.

A Westinghouse bituminous gas producer for supplying fuel to gas engines, as well as furnishing gas for solder baths and enameling kilns, has been installed by the S. F. Bowser Manufacturing Company, maker of oil storage and distributing tanks and automatic weighing pumps, in its modern factory at Fort Wayne, Ind. This Type T producer plant, of 350-hp capacity, supplies three 120-hp tandem-horizontal engines, direct-connected to direct-current generators. These furnish power to the shops, which are motor-driven throughout. The equipment replaced by the present installation comprised three 150-hp Scotch marine boilers, equipped with underfeed stokers, supplying steam to 50-hp and 125-hp simple engines. In the shops a large quantity of gasoline was formerly used for melting solder, while coke was required for the enameling kilns. Recognizing the superior economy to be obtained from producer equipment, as well as the advantage of doing away with gasoline and coke in its own special case, the Bowser company decided to install a complete new equipment for gas engines and gas producers. The matter of selecting a bituminous producer was carefully weighed, and members of the firm visited a number of installations throughout the country to study the performance of the types in operation at the present time. The West Virginia coal, 13,000 b.t.u. per pound, used in the producer at present is delivered at a cost of $2.55 per ton. A Green County, Indiana, coal, of approximately the same heat value, has been successfully experimented with, and will cost, delivered, $2.25 per ton. The installation has been under the supervision of Mr. A. A. Bowser, brother of the president of the company.

Combined Shaving Mirror and Lamp.

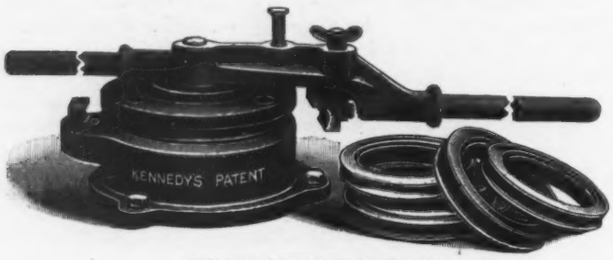
Men who shave themselves realize the great advantage of having a strong light thrown just where it is needed on any part of the face. The Federal Electric Company, of Chicago, has brought out a combined shaving mirror and lamp and reflector which, as shown in the illustration, can be placed in any position to throw the light where it is wanted. The reflector throws all the light on the face below the eyes. No light is reflected into the eyes or into the mirror. The mirror is 6¾ in. wide and 9 in. high, and is mounted in an easel frame with a cylindrical reflector at the base. This reflector is equipped with a tubular incandescent electric lamp, the light from which is reflected through a horizontal opening. Six feet of lamp cord and a plug are furnished, so that this convenient device can be attached to any lamp socket. The fixture is made in nickel, brush brass, or oxidized copper finish, and the lamp is rated at 16 cp.

COMBINED SHAVING MIRROR AND LAMP.

Conduit-Bending Machine.

A machine which is applicable for bending welded, butt-jointed and seamless tubing; also round, flat, angle, tee and channel bars in copper, brass, iron or other metal is shown herewith. The apparatus is built by the Kennedy Bending Machine Company and marketed by The Business Development Company, 36 Upper Thames Street, London, E. C., England. By its use any number of bends can be made at any angle and in any position on long lengths of work, thereby rendering the employment of stock elbows, bends, and sockets unnecessary and avoiding much cutting and screwing. Tubing within the capacity of the machine is bent cold, without annealing or loading. In the machine illustrated, for example, a ring, grooved to correspond to the size of the material and the radius to which it is to be bent, is placed in position on a screwed mandrel of the machine, between the top flange and base of the machine. The flange is tightened by hand until it just grips the work, and after bending the tube by means of the handle, the

top flange is unscrewed by depressing the plunger provided in the lever into one of the holes on the flange. A few drops of oil or grease are used on the working surfaces of the flanges to ease the bending operation. The machines are built in various sizes for manual or power operation. The smallest size takes brass and copper tubes from ¼ in. to ¾ in. outside diameter



CONDUIT BENDING MACHINE.

and standard iron tubing from ⅛ in. to ½ in. bore, the minimum radius of the bend ranging from 1⅛ in. to 2½ in. Six pipe rings form part of the equipment.

Telephones for Railroad Service.

The Cleveland, Akron & Columbus Railroad Company has recently installed a composite telephone circuit on its lines between Akron and Columbus, Ohio, a distance of 130 miles. The line is constructed of No. 9 copper, and has three intermediate telegraph offices between the terminal telephones. There are

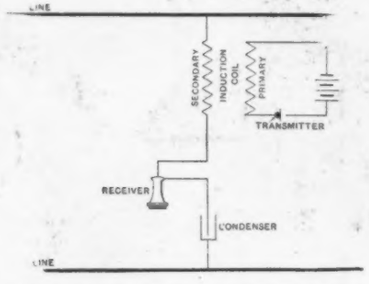


FIG. 1.—ARRANGEMENT OF CIRCUIT.

also three intermediate telphone stations connected to the line.

In connection with this service the company has equipped its wrecking train with a portable composite telephone, which may be connected to the line at any point along the road, thus enabling direct connection to be made with headquarters at all times. In addition to this, an extra portable composite tele-

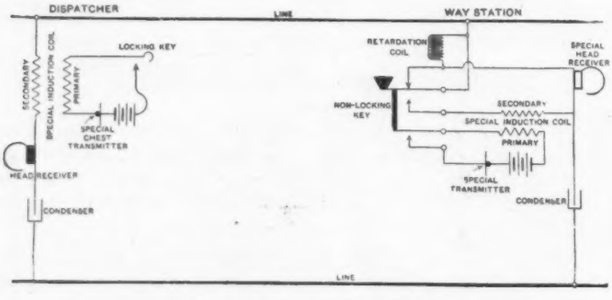


FIG. 2.—DIAGRAM OF COMPOSITE TELEPHONE CIRCUIT.

phone is kept at the division headquarters to be used on inspection trips or in cases of emergency.

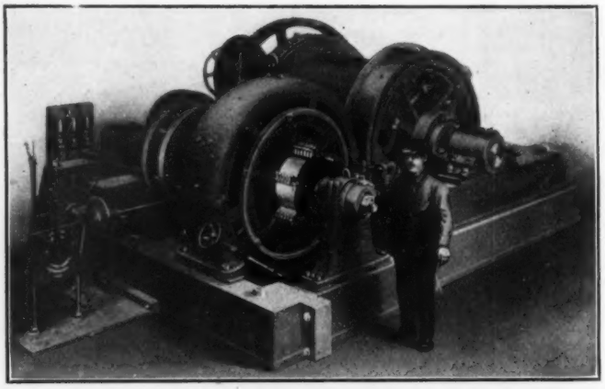
The Western Electric Company's composite telephones are used in the stations, and its portable set is used on the wrecking train. These sets are shown in the illustrations. It is reported that first-class service is obtained with this equipment.

It will be readily seen that the above system enables additional service to be obtained at a very small cost, as an existing telegraph wire may be used for this service without interfering with the operation of the telegraph service.

Electric Mining Hoist.

The Washington Coal & Coke Company, at Dawson, Pa., has recently installed an electric hoist for use in hauling 35 mine cars, averaging 3800 lb. each when loaded, up a maximum grade of 8½ per cent, 8000 ft. long, at a speed of 600 ft. per minute. The loaded cars start at the bottom of the slope on a 4 per cent grade, which gradually increases till the maximum grade of 8½ per cent is reached near the top, where the loaded cars are pulled in on a landing on a grade of about 6 per cent and on a curve of 150-ft. radius. The empty cars will be allowed to drift down the slope by gravity, controlled by a brake on the hoist drum.

The hoisting drum is 6 ft. in diameter and 5 ft. wide between flanges. It is fitted with a hand brake on one end and a hand-operated friction clutch on the other end. The hoist is driven through a flexible coupling by a 500-hp, direct-current, non-reversing, compound-wound Westinghouse motor, and controlled by a standard semi-automatic Westinghouse magnetically controlled unit switch controller. These switches are operated from the controller shown in the illustration, the controller carrying only small currents while the main motor current is



ELECTRIC MINING HOIST.

handled by the magnetically operated switches, thus doing away with the difficulties from arcing.

This controller has an accelerating relay which prevents the starting switches from closing too rapidly and thereby prevents too large starting currents. Thus the second switch cannot close until the current allowed to flow by the closing of the circuit has fallen to a predetermined value. As soon as this value is reached, the second switch closes, thereby short-circuiting a resistance section and the current rises, but the third switch cannot close until the current has again fallen to the predetermined value. This not only prevents injury to the motor from careless handling during acceleration, but also insures the most rapid starting possible.

The controller also has a safety relay which opens the resistance switches in cases of excessive overload, and thereby protects the motor while running. If this relay operates while the motor is running, the motor does not stop, but is automatically brought up to its full speed again. This is a particularly valuable feature in an installation of this kind, where the cars may strike some obstruction, as it affords perfect protection to the apparatus.

When it is remembered that this hoist is installed some 800 ft. below the surface of the ground, the advantages of the electric transmission of power are evident. In no other way could this large amount of power be transmitted as economically nor as easily. The hoist was supplied by the Connellsville Manufacturing & Mine Supply Company.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

The general improvement in business conditions continues. There are only good signs in every line of trade. The actual sales of wholesalers and jobbers may have receded somewhat from former figures, but this is only because the August rush of buyers is over and the immediate period is one in which small orders are the rule and reorders have not begun. It is in the industrial department that the wonderful records are being made. It is hardly going too far to say that manufacturing has never in the history of the country been more active. Operations are expanding in every line, and in the iron and steel trades record outputs are the rule. All the principal plants are now said to be working at full capacity and in many instances night shifts have to be employed. It is also noticeable that many plants which have not heretofore been active are beginning to look up and wheels are turning in many quarters where there has been long inactivity. Already complaints are being made that there is a scarcity of skilled labor, and the wage situation is distinctly better. The railway traffic is increasing and earnings are growing larger with each succeeding report. It is enough for the crop situation to say that it is not unsatisfactory. The yield of cotton will be short—15 per cent less than last year, but this has been known for months and the advance in prices has practically offset for the producers the falling off in volume. The corn crop will not be up to the first estimates but will still be liberal, and other crops will be above the average. Collections are distinctly improving, and in the Central West, where the crops are generally better than elsewhere, they are very satisfactory. Business failures for the week ended Sept. 9, as reported by *Bradstreet's*, were 191, as against 166 the previous week, 191 in 1908, 172 in 1907, 164 in 1906, and 188 in 1905.

THE COPPER MARKET.

The feature of the copper market last week was the publication of the figures of the Copper Producers' Association for August. These showed a record-breaking production, smaller exports and domestic deliveries, with a consequent increase in stocks. The figures are: Production, 120,597,234 lb.; exports, 48,382,704 lb.; domestic deliveries, 59,614,207 lb.; stock Sept. 1, 135,196,930 lb.; increase in stock during August, 12,600,323 lb. Before the publication of these figures the market had been dull and prices had shown a disposition to sag and since the report was given out that tendency has been accelerated. It has been quite generally recognized that the heavy takings in July, which made such a surprising reduction in the stock on Aug. 1, did not all go to the melting pot, and that in second hands and in the hands of consumers large quantities of copper were being carried. This adds to the difficulty of sustaining prices, and last week it was understood that actual sales were generally made at concessions from asking prices. The increase in the visible, in Europe, for August, was 26,203,200 lb., which added to the increase here made a total increase of 38,803,523 lb. Exports for the month, including Sept. 13, have been 6,806 tons. The daily call on the Metal Exchange, at 12:30 o'clock Sept. 13, quoted standard copper as follows:

	Bid.	Asked.	Settling price.
Spot	12.40	12.60	.....
September	12.45	12.65	12.55
October	12.50	12.70	12.60
November	12.55	12.75	12.65
December	12.60	12.80	12.70

The London prices Sept. 13 were as follows:

	Noon.	Close.
	£ s d	£ s d
Standard copper, spot	58 5 0	58 5 0
Standard copper, futures	59 1 3	59 2 6
Market	Weak	Easy
Sales of spot		700 tons
Sales of futures		1,900 tons

Extreme fluctuations for this year:

	Highest.	Lowest.
Standard	13.00	12.62½
Lake	14.55	12.55
Electrolytic	14.25	12.12½
Casting	14.12½	12.00
London, spot	£64 2 6	£54 12 6

CONTRACTS FOR WINNIPEG (MAN.) MUNICIPAL PLANT.—Last fall the city called for tenders for general equipment in connection with the civic power plant now under construction at Point du Bois. The tenders were considered too high and this summer new tenders were called with the result that a saving of approximately $157,000 to the city was effected. The following tenders were accepted at the last meeting of the City Council: Turbines, Jens, Orten, Baving & Company, London, England, $97,150, including $11,000 for erection; generators and exciters, Vickers Sons & Maxim, Ltd., Sheffield, England, $93,000, including price of erection; transformers, switching and protective apparatus, Canadian Westinghouse Company, Ltd., Hamilton, Ont., $150,800, including spare parts; light, heat and power system, generating system, Canadian General Electric Company, Toronto, Ont., $11,600; traveling cranes, Canadian Fairbanks Company, Ltd., Winnipeg, Man. (Niles-Bement-Pond Company), $14,900, including estimated cost of erection; auxiliary apparatus, Canada Foundry Company, Ltd., Toronto, Ont., $27,520; Canadian Fairbanks Company, Ltd., Winnipeg, Man., $6,901, and allowance for contingencies and spare parts, $25,049. At the present time there is a credit of $316,606.67 under the original estimate in the cost of the plant, which will be ready for operation by the end of 1911.

McCALL FERRY POWER COMPANY.—Work on the great dam of the McCall Ferry Power Company is being pushed forward rapidly and about 225 men are now employed on the work. A contract has been made by J. Edward Aldred, receiver for the company, with the Empire Engineering Company, of 60 Broadway, New York. Beverly R. Value, of this firm, will have immediate charge of the work. The Empire Engineering Corporation will construct the dam and the water power station, but will not construct the transmission lines into Baltimore or some other city. William Barclay Parsons is president of the Empire company. It is understood that a new company is in process of formation to purchase at receiver's sale the entire property of the McCall Ferry Power Company, but in the meantime the work of construction will go on under the receiver's contract. It is expected finally to develop 50,000 hp, which will be divided between five units. It is understood that the first market that will be sought by the McCall Ferry Power Company will be Baltimore, when its charter gives it a right to sell power in competition with the Consolidated Gas, Electric Light & Power Company.

NEW IBERIA (LA.) SUBURBAN RAILWAY.—A proposition has been submitted to the Municipal Electric Light & Water Works Board of New Iberia, La., offering to lease the plant for a term of 25 years for the purpose of operating a suburban line of railways which it is proposed to construct from that city to Jeanerette. The syndicate that is back of the scheme is headed by H. A. Mentz, of New Orleans. He agrees to furnish the city free of cost the quantity of water and electricity it is now using, and to charge only $6 per year for each additional 16-cp incandescent lamp required; $75 for each additional arc lamp, and $50 for each additional water plug. He also agrees to have the plant entirely renovated and running within nine months, and the electric system within two years. Rates for electricity to domestic consumers will not be increased.

ELECTRICAL CONSTRUCTION.—Among the items printed under Construction Notes in the present issue are announcements of proposed new plants or considerable extensions of present plants at Portland, Me.; Monterey, Mex.; Alamogordo, N. M.; Meridian, Miss.; Central City, Col.; Wilmington, Del.; Golden, Col.; Rockville, Conn.; Montgomery, Ala.; Rochester, Minn.; Mohawk, N. Y.; Monterey, Cal.; Salt Lake City, Utah; Milwaukee, Wis.; Hartsells, Ala.; Sarasota, Fla.; Cordova, Alaska; Lone Wolf, Okla.; Norwich, N. Y.; Clinton, Okla.; Chicago, Ill.; Central City, Neb.; Blackwell, Okla.; Pittsburgh, Pa.; Guadalajara, Mex.; Westville, Okla.; Shelley, Idaho; Monmouth, Ill.; London, Ont., and Anderson, S. C.

GENERAL ELECTRIC IN JAPAN.—Announcements have been made in the daily newspapers that the General Electric Company has acquired a controlling interest in the Shibaura Engineering Company, of Tokio, which is owned by the Mitsui family. When this statement was presented to one of the vice-presidents of the General Electric Company he said that it was entirely erroneous. While he was willing to admit that negotiations had been pending between the Shibaura Engineering Company and the General Electric Company, there had so far been nothing done which would mean the control of the Japanese company by the American company. The goods of the General Electric Company have been sold heretofore in Japan by the Mitsui company, which is the holding organization of the Shibaura company. This arrangement has not been disturbed, and will not be disturbed. The business of the General Electric Company has amounted to more than 3,000,000 yen a year in Japan, and it is claimed that it will hereafter be much greater.

ASSOCIATION OF EDISON PURCHASING AGENTS.—At a meeting of the Association of Edison Purchasing Agents, which recently took place at Briar Cliff Lodge, Briar Cliff Manor, N. Y., the following officers were elected: H. C. Lucas, president, purchasing agent, Philadelphia Electric Company; W. H. Francis, first vice-president, purchasing agent, Edison Electric Illuminating Company of Boston; J. W. Brennan, second vice-president, purchasing agent, The Edison Illuminating Company, Detroit, Mich.; H. F. Frasse, secretary, purchasing agent, Edison Electric Illuminating Company of Brooklyn; Andrew Banks, Jr., treasurer, purchasing agent, Consolidated Gas, Electric Light & Power Company of Baltimore; J. J. Miley, stock controller, purchasing agent, Minneapolis General Electric Company.

WESTINGHOUSE INSTALLATIONS.—The Monarch Lumber Company, of Portland, Ore., has installed two 500-kw Westinghouse steam turbines in its mill at Stockdale, Ore., which will be employed to drive 2300-volt, three-phase, 60-cycle, alternating-current generators supplying the local lighting and power load. The sheet and tin-plate mill of the new Aliquippa works of the Jones & Laughlin Steel Company, on the Ohio River below Pittsburgh, will be served with power to operate a number of direct-current motors, through a rotary converter, from a 500-kw, 6600-volt, three-phase, 60-cycle Westinghouse turbo-alternator. The fuel used in the boiler plant will be coke-oven gas, and the turbine will operate on a steam pressure of 150 lb., exhausting into a vacuum of 28 in.

INCREASE IN SUBWAY TRAVEL.—The full report of the Interborough Rapid Transit Company shows that the subway division is the one that is growing in popularity. During the year that ended June 30, the subway earnings increased 2.81 per cent and the earnings of the elevated lines decreased 1.58 per cent. The number of passengers carried on the subway increased 18.95 per cent, while the number carried on the elevated decreased 2.33 per cent. The total number of passengers carried on the subway during the year was 514,680,342 and the average daily record was 89,631 greater than last year. Much of the subway increase is attributed to the rapid settlement of recently opened up territory.

WESTERN ELECTRIC BUSINESS EXPANDING.—Returns for August show that the business of the Western Electric Company ran 60 per cent ahead of the same month last year and also show a gain of about 5 per cent over July. It is said that the August sales were at the rate of about $53,000,000 per year, which was approximately the amount of business done in 1907. The first nine months of the company's fiscal year, which ended with Aug. 31, show that the business for the year will run about $47,000,000. A very large part of the company's business at this time is for telephone apparatus. The company is also doing a good trade in small motors for mill service.

APPLICATION FOR ELECTRICAL AGENCY IN THE LEVANT.—An American consul in the Levant reports that all manner of electrical appliances are freely admitted and large quantities have been imported into that region. He states there is no reason why American-made goods should not be introduced in considerable quantities, as an active local agent is alone needed. The name of a business man who desires to act in such a capacity and would like to get in touch with houses in the United States is given in the report. Further particulars may be obtained on application to the Bureau of Manufactures, Washington, mentioning report No. 3838.

ALLIS-CHALMERS COMPANY'S EXTENSIONS.—With reference to rumors recently circulated to the effect that large shop and foundry extensions are to be undertaken this fall by the Allis-Chalmers Company, it is authoritatively stated by President W. H. Whiteside that no further additions to the West Allis works are contemplated. However, an extension to the Cincinnati works of the company is being made which will give employment to about 1000 additional men. Construction work and the installation of new equipment were commenced there some weeks ago.

TO ERECT A BIG ELECTRIC SIGN.—J. H. Hallberg has been commissioned to design two enormous electric signs for the Jacob Ruppert ice plant to be erected at Third Avenue and 132d Street, New York. These two signs are each to be 140 ft. long and 100 ft. high, and together will contain more than 5500 four-cp tungsten lamps. One of them will face west and the other south, and they will be illuminated alternately. The signs will be operated on a 20-kw, 115-volt service, using Hallberg economizers.

ELECTRICAL APPARATUS WANTED.—The Sanitary District, American Trust Building, Chicago, which operates the Drainage Canal hydro-electric plant, advertises for proposals for copper and aluminum conductors, high-tension insulators, a high-pressure pumping unit and induction motors. All proposals must be on blank forms furnished by the Sanitary District and must be in accordance with plans and specifications on file in the office of E. B. Ellicott, electrical engineer of the district. Bids will be received until noon on Sept. 22.

ELECTRIC LOCOMOTIVES FOR JAPAN.—The contract for 12 50-ton electric locomotives, which was under consideration by the Imperial Government Railways of Japan for some months, has finally been awarded to Siemens-Halske Company, of Germany. Both the Westinghouse and the General Electric companies made bids for this contract, but the German prices proved more attractive to the Japanese Government.

ELECTRICAL SUPPLIES FOR ISTHMIAN CANAL.—The Isthmian Canal Commission has invited proposals until Sept. 20 for a long list of miscellaneous electrical supplies, including wire, conduit, line fittings, electric bells, lightning arresters, insulators, etc. Bids should be forwarded to Capt. F. C. Boggs, U. S. N., general purchasing officer, Isthmian Canal Commission, Washington.

NEW MEXICO HYDRO-ELECTRIC PLANT.—The Blue Water Development Company, operating 100 miles west of Albuquerque, on the main line of the Santa Fé, will have its dam completed by the middle of the winter. The dam will be designed to irrigate 21,000 acres, and will also be used to operate the power plant furnishing power for Central New Mexico.

NEW ELECTRIC RAILWAY FOR ALBUQUERQUE, N. M.—A stock company has been formed by the citizens in the eastern section of Albuquerque, N. M., which will construct a second electric street car line in that portion of the city. The stock is practically all subscribed and the franchise is applied for. Construction will be started without delay.

Financial Intelligence.

THE WEEK IN WALL STREET.

The week in Wall Street was all Harriman. There was no other talk and no other interest that had any effect on the market. On Sept. 7 and 8, when the condition of the great leader was in doubt, the market was inactive and waiting; on Sept. 9 when it became generally known early in the morning that certain death was hovering over Arden the market broke violently and became almost demoralized. On Friday morning when there had been 18 hours' reflection and it was realized that the financial world was not coming to an end, even though such a leader had passed away, stocks opened stronger and there was really a better tone to the trading than there had been for many days. It was evident, even before the market opened, that strong hands were at the helm. The ever present bears who had been preaching disaster found themselves up against a stone wall of support. Their few feeble efforts at selling were met by such positive buying orders that their only recourse was to fly to cover and in their haste they piled over each other to such an extent that prices jumped up with remarkable suddenness. There have been no more efforts to raid the market, and no more talk of disaster. There is

no doubt that Harriman properties are in first class physical shape and that they are not largely held on speculative margins. There will be no necessity for an unloading, there will be no occasion for any financing to carry long lines. Outside of this uncertainty over the Harriman issues there has been absolutely nothing to disturb the serenity of the Street. The crop and industrial conditions are all that could be desired. Money continues to be easy and the demand for bonds both here and abroad is as insistent as ever. Quotations for money Sept. 13, were: call 2½ @ 2½ per cent, 90 days 3¼ @ 3½ per cent. The quotations in the table are those of the close on Sept. 13.

NEW YORK.

	Sept. 3.	Sept. 13.	Shares sold.		Sept. 3.	Sept. 13.	Shares sold.
All.-Ch.	15¼	15⅜*	1,300	Int.-Met., pfd..	46½	46	12,400
All.-Ch., pfd...	53	51	1,400	Mackay Cos...	84	80¾*	800
Amal. Cop....	84	78¾	127,800	Mackay Cos.,p.	75⅛	74*	300
Am. D. T.....	20½*	20½*	———	Man. Elev....	143*	141½	750
Am. Loc.....	59⅜	59	7,545	Met. St. Ry...	23*	20*	200
Am. Loc., pfd.	115	115	455	N.Y. & N.J.Tel	139¼*	139¼*	———
Am. Tel. & Cbl.	76*	83½*	100	Steel, com....	80⅛	78½	878,483
Am. T. & T...	141⅜	141½	24,319	Steel, pfd.....	127½	124¾	17,400
B. R. T.....	79	76⅜	14,200	W. U. T.....	75¼	79	16,220
Gen. Elec.....	166½	164	4,400	West'h, com...	86	84½	5,000
Int.-Met., com.	14⅛	14½	5,725	West'h, pfd...	130	130*	———

PHILADELPHIA.

	Sept. 3.	Sept. 13.	Shares sold.		Sept. 3.	Sept. 13.	Shares sold.
Am. Rys.....	46*	46	———	Phila. Elec....	12⅛	12¾*	———
Elec. Co. of A.	12¼	12⅛*	———	Phila. R. T...	30¼	30*	———
Elec. St. B'ty..	63¼	62	———	Phila. Trac...	91*	91⅛*	———
E. S. B'ty,pfd.	30*	30*	———	Union Trac...	53¾	54	———

CHICAGO.

	Sept. 3.	Sept. 13.	Shares sold.		Sept. 3.	Sept. 13.	Shares sold.
Chi. City Ry..	180*	180*	———	Chi. Tel. Co..	136	135¼*	———
Chi. Rs.,Ser.1.	110*	110*	———	Met. El., com.	17¾*	15⅛	———
Chi. Rs.,Ser.2.	37½*	36¾	———	Met. El., pfd.	40*	40*	———
Com. Edison..	120½*	120½	———	Nat'l Carbon..	95*	96¾	———
Chi. Sub'ws...	18⅝	10½	———	Nat'l C., pfd..	120*	119¼*	———

BOSTON.

	Sept. 3.	Sept. 13.	Shares sold.		Sept. 3.	Sept. 13.	Shares sold.
Am. T. & T...	141¾	141½	———	Mex. Tel.....	2¼*	2¼*	———
Cum. Tel.....	144*	145*	———	Mex. Tel., pfd.	6*	6*	———
Edison E. Ill..	256	255	———	N. E. Tel....	136	134*	———
Gen. Elec.....	167½	164¾	———	W. T. & T....	12½*	10⅞	———
Mass. E. Ry...	17	16	———	W. T. & T., p.	89*	89*	———
Mass E. R., p.	77	77½	———				

*Last price quoted.
Shares sold are for week Sept. 6 to Sept. 11.

DIVIDENDS.

Butte Electric & Power Company, preferred, quarterly, 1¼ per cent, payable Nov. 1; common, quarterly, 1½ per cent, payable Oct. 1.

Canadian General Electric Company, preferred, quarterly, 1¾ per cent, payable Oct. 1.

Canadian Westinghouse Company, Ltd., quarterly, 1½ per cent, payable Oct. 11.

Carolina Power & Light Company, preferred, quarterly, 1½ per cent, payable Oct. 1.

Cincinnati & Suburban Bell Telephone Company, quarterly, 2 per cent, payable Oct. 1.

Columbus (Ohio) Railway & Light Company, quarterly, ¾ per cent, payable Oct. 1.

Cumberland Telephone & Telegraph Company, quarterly, 2 per cent, payable Oct. 1.

Fonda, Johnstown & Gloversville Railroad, preferred, quarterly, 1½ per cent, payable Sept. 15.

Houghton County (Mich.) Traction Company, preferred, semi-annual, 3 per cent; common, initial, 2 per cent, both payable Oct. 1.

Laclede Gas Company, common, quarterly, 1½ per cent, payable Sept. 15.

Louisville Traction Company, common, quarterly, 1 per cent, payable Oct. 1.

Manila Electric Railway & Lighting Company, common, quarterly, 1 per cent, payable Oct. 1.

Safety Car Heating & Light Company, common, quarterly, 2 per cent, payable Oct. 1.

St. Joseph (Mo.) Railway, Light, Heat & Power Company, quarterly, 1¼ per cent, payable Oct. 1.

Syracuse Rapid Transit Company, preferred, quarterly, 1½ per cent, payable Oct. 1.

Toronto Railway Company, quarterly, 1¾ per cent, payable Oct. 1.

Twin City Rapid Transit Company, preferred, quarterly, 1¾ per cent, payable Oct. 1.

Union Traction Company, of Indiana, preferred, semi-annual, 2½ per cent, payable Oct. 1.

United Gas Improvement Company, of Philadelphia, quarterly, 2 per cent, payable Oct. 15.

United Traction & Electric Company, of New Jersey, quarterly, 1¼ per cent, payable Oct. 1.

West Jersey & Seashore, semi-annual, 2½ per cent, payable Oct. 1.

Western Union Telegraph Company, quarterly, ¾ per cent, payable Oct. 15.

Wilkes-Barre Gas & Electric Company, 1 per cent, payable Oct. 1.

WESTERN UNION TELEGRAPH EARNINGS.—A preliminary estimate of the earnings of the Western Union Telegraph Company for the quarter which will end Sept. 30, 1909, has been issued, and shows an increase in net revenues of about $135,000. In giving out these figures President Clowry says that the figures estimated for the present quarter, which do not include the cost of construction or betterments, show a net profit of 1.57 per cent, or at the rate of 6.28 per cent per year. Including the cost of construction and betterments the net profit for the quarter is 1.11 per cent, or at the rate of 4.44 per cent per year.

ALBANY & HUDSON RAILROAD.—At the sale of the property of the Albany & Hudson Railroad on Sept. 8, under foreclosure in court, the purchaser was I. W. Day, of New York, who is the secretary of the Bond and Stockholders' Reorganization Committee. The price which Mr. Day paid for the property was $50,000, which is merely nominal, as the sale was considered simply a legal method of preparing the way for the reorganization plans. There is now no obstacle to the carrying out of the reorganization of the Albany & Hudson as originally outlined by the committee, full details of which have been given in these columns.

ECONOMIC POWER & CONSTRUCTION COMPANY.—At the hearing in Albany last week before the Public Service Commission of the Second District on the application of the Economic Power & Construction Company for authority to continue to supply electricity for light, heat and power purposes, the commission announced that it intended to go into the financial affairs of the company, and also its connection with the holding company, the New York Power Securities Company. It will be remembered that the Economic Power & Construction Company received a remarkable charter from the Legislature in 1893, which gave it a right to enter upon any street or public place in the State of New York without securing the consent of the local authorities. These charter powers were declared unconstitutional by the Court of Appeals in May last, and the company is now attempting to operate subject to the Public Service Commission, the same as other public utility companies.

AMERICAN TELEPHONE STOCK EXCHANGE.—It is announced that fully 90 per cent of the stockholders of the New York & New Jersey Telephone Company, the Bell Telephone Company of Pennsylvania, the Central District & Printing Telegraph Company, of Pittsburgh, and the Bell Telephone Company of Buffalo, have turned in their stock for exchange for certificates of the American Telephone & Telegraph Company. It is also stated that many stockholders now abroad have written that it would be impossible for them to take their stock from the safety deposit vaults until later, and in cases of this kind the time for exchange, which expired Sept. 1, has been extended. Upon delivery of the stock certificates and payment of cash for the fraction, if any, which the shareholders desire to buy, negotiable receipts have been issued by the American company showing the number of shares to which the depositor is entitled. Such receipts are convertible into stock on or before Dec. 31. On Oct. 15 the holders of these receipts will be paid the regular quarterly dividend of 2 per cent.

BRONX GAS & ELECTRIC COMPANY.—The Bronx Gas & Electric Company has applied to the Public Service Commission for permission to issue bonds to the amount of $1,500,000, to be secured by a mortgage on the company's property. There is already an outstanding issue of $500,000 covered by a mortgage, and there are also small mortgages amounting to $30,100. It is stated that the purpose of the new issue is to retire these obligations. The outstanding stock of the company is $486,500, upon which dividends of 5 per cent have been paid for the past four years. A public hearing will be held on the application.

INTERNATIONAL TELEGRAPH CONSTRUCTION COMPANY.—An order has been granted in the Chancery Court at Trenton, N. J., requiring the International Telegraph Construction Company, which has a plant for the manufacture of wireless telegraph apparatus at 72 York Street, Jersey City, to show cause on Sept. 18 why a receiver should not be appointed. Philip C. Kullman, a minority stockholder, who owns 225 of the 1000 shares, and John Firth, to whom the company owes $2,203.80, made the application. The tangible assets, consisting of machinery and stock in trade, are stated not to exceed $30,000. The bill of complaint recites that the majority of the stock is owned by the United Wireless Telegraph Company. On Aug. 10 the United company recovered judgment against the International Telegraph Construction Company for $34,266.44. Under this judgment the sheriff of Hudson levied on the property of the International company and advertised it for sale Sept. 9. In addition to the application for the appointment of a receiver, Kullman and Firth petitioned for an order restraining the sheriff from proceeding with the sale under the judgment levy, and this request Vice-Chancellor Stevenson also granted. The United Wireless Company owns 70 per cent of the stock of the International, and, according to statements made by one of the officials of the former company has been putting up the money necessary for the company's operation. There has been some misunderstanding with the minority stockholders and the United Wireless has been anxious to have the company wound up at receiver's sale. It is stated that the United Wireless Company intends to purchase the property of the International whenever it is sold and that the plant will be continued in the manufacture of apparatus as heretofore.

AMERICAN RAILWAYS COMPANY.—The report of the American Railways Company for the fiscal year ending June 30, 1909, shows that the gross earnings of its subsidiary companies were $2,865,229, a decrease of $62,207. After paying the fixed charges, interest and taxes the net income of these companies was $310,728. After disbursement to the stock holders of the company of the regular 6 per cent dividend, there was added to the surplus account $5,022. The American Railways Company, of which Jeremiah J. Sullivan is president and William F. Harrity is first vice-president, is a Philadelphia concern, and owns a number of public service corporations throughout Pennsylvania and the Middle West. The companies owned entirely are: Home Electric Light & Steam Heating Company, Tyrone, Pa.; Bridgeton (N. J.) Electric Company; Bridgeton & Millville Traction Company; People's Railway Company, Dayton, Ohio; Altoona (Pa.) & Logan Valley Electric Railway Company; Du Page Construction Company, Joliet, Ill; Dellwood Park Company, Joilet, Ill.; Franklin Real Estate Company, Blair Electric Company, Bellwood, Pa., and all but a few shares of the Scranton (Pa.) Railway Company and the Springfield (Ohio) Railway Company. The balance sheet of the holding company shows total assets of $12,610,882.

CHANGE IN PHILADELPHIA RAPID TRANSIT.—President John B. Parsons, of the Philadelphia Rapid Transit Company, has resigned his position to take effect Sept. 15. It is generally expected that Mr. Parsons will remain with the company as chairman of the board of directors, and that the general manager, Charles O. Kruger, will succeed him as president. Mr. Parson's resignation was not a surprise to financial circles, as it had been known for a number of months that he was anxious to be relieved of the responsibilities of his office. Mr. Kruger has been with the company for many years, and is thoroughly identified with its upbuilding. The August passenger receipts of the company showed an increase of about $91,000 over August, 1908. This follows an increase in July of $139,767, so that the first two months of the current fiscal year show that the gross earnings have gone up $231,000 over the same period last year. It is particularly interesting to note that the improvement in the earnings of this company has been marked since the abolishment of strip tickets.

CLEVELAND ELECTRIC ILLUMINATING COMPANY.—A mortgage for $30,000,000 in favor of the Citizens' Savings & Trust Company has been filed by the Cleveland (Ohio) Electric Illuminating Company to cover a bond issue of that amount. The bonds will be issued only as money is needed for extensions and improvements and the sale will be restricted so as to make them sell at a premium. The starting price has been made 103 by Spencer Trask & Company, of New York, who will handle the issue. The $1,700,000 first mortgage 5s and $1,500,000 general mortgage 6s will be replaced by bonds of the new issue. This year $4,000,000 bonds will be issued, including those used to take up the present bonds. After the sale of the first $4,000,000, the bonds may be issued in the proportion of $800 to $1,000 cash put into the property by the company after it has earned, during the preceding year, twice the amount of interest on all outstanding bonds.

SOUTHERN CALIFORNIA EDISON COMPANY.—The recently organized Southern California Edison Electric Company, which will own and operate the Edison Electric Company of Los Angeles, has filed a certification for the issue of $30,000,000 of capital stock, and gives Chino, San Bernardino County, as its principal place of doing business. Details of this incorporation, with the names of the promoters, were given in our issue of July 22. The officers of the Edison Electric Company state that the business of the corporation has been increasing at the rate of 35 to 40 per cent a year and that increased capital was absolutely necessary to care for the growth. President Miller and his sons, with George A. Bachelor, vice-president of the E. H. Rollins Company, of San Francisco, have gone to Santa Ana Canyon and Bear Valley to inspect the power houses of the company.

KENTUCKY RAPID TRANSIT COMPANY.—The Kentucky Rapid Transit Company was incorporated in Delaware last week by Samuel M. Clement, Jr., of Philadelphia, with a capitalization of $10,000,000, $2,500,000 being preferred and $7,500,000 common. The principal operations of the company, it is said, will center about Louisville, Lexington and Frankfort, Ky., but it is the purpose of the company to absorb other traction companies in that State. Besides the operation of railway lines, the charter granted privileges of operating electric light, power and gas plants. At the office of George S. Graham, 42 Broadway, New York, one of the incorporators and chief attorney for the new company, it was stated that as yet the organization of the company was of a confidential nature and that no statement as to the properties to be absorbed could be given out.

BECK FLAMING LAMP COMPANY.—In the auction of securities in New York last week there were a number of notes and claims issued by the Beck Flaming Lamp Company put up and sold. It is understood that these sales were made simply in order to fulfill a legal formality, and have nothing to do with the condition of the company. At the same time 182 shares of the Beck Flaming Lamp Company stock, par value $100, were sold at $100 per share, and there were also 250 shares of the New York Beck Lamp Company stock, par value $100, sold for $50 a share. The latter company, it is said, was simply the selling concern for the Beck lamps, and that it will go out of existence. All of these sales were made to the original parties offering the shares for sale, and were simply of a technical character.

MEXICO STEEL & CHEMICAL COMPANY.—A new organization has been formed in Mexico City with a capital of $1,000,000 to be known as the Mexico Steel & Chemical Company. The new concern is organized for the purpose of making, it is said, a high-grade steel by an electrical process, and of also making calcium carbide. Dr. F. S. Pearson, of New York, the head of the Mexico Light & Power Company, is the moving spirit in this new corporation. R. C. Brown, who is the managing director for the Pearson interests in Mexico, will be in charge of the new company.

CUMBERLAND TELEPHONE COMPANY'S EXTRA DIVIDEND.—The directors of the Cumberland Telephone & Telegraph Company, in addition to the regular quarterly dividend of 2 per cent, have declared an extra dividend of 2 per cent payable on the stock of the American Telephone & Telegraph Company. The East Tennessee Telephone Company recently reduced its indebtedness to the Cumberland company by turning over to it 3800 shares of the American company, and it is this stock that is now being distributed as a dividend.

MICHIGAN & CHICAGO RAILWAY COMPANY.—A mortgage for $3,000,000 in favor of the Chicago Title & Trust Company has been filed in Kalamazoo, Mich., by the Michigan & Chicago Westbound Railway Company. The mortgage is to cover an issue of bonds of the same amount. The company proposes to construct a railway between Kalamazoo and Grand Rapids.

GENERAL NEWS

Construction News.

HARTSELLS, ALA.—Plans are being made to establish an electric light plant in connection with the proposed cottonseed-oil mill to be erected in Hartsells. For further information address J. H. Corsbie, Mayor.

MONTGOMERY, ALA.—The Citizens Light, Heat & Power Company has filed a deed of trust in the office of the Judge of Probate to secure an issue of $500,000 in bonds, of which $200,000 has been sold, the proceeds to be used for improvements and extensions to the plant. Plans are being made by the company to install a 500-hp steam turbine and a 2000-kw generator direct-connected. The balance of the bonds will be held for future extensions.

CORDOVA, ALASKA.—Plans are being made by the Cordova Power Company to extend its pipe lines to Crator or Summit Lake, which will involve an expenditure of about $50,000. About three miles of pipe will be needed.

LITTLE ROCK, ARK.—C. E. Hart, of Joplin, Mo., has been in the city recently making investigations pertaining to the project of erecting transmission lines to Little Rock, Hot Springs and Pine Bluff, to supply electricity in the three named cities, in connection with a large power plant to be erected at a cost of $1,000,000, in Southern Arkansas. Messrs. Paret & Beard, Dwight Building, Kansas City, Mo., it is said, can furnish further information.

CHICO, CAL.—F. P. Bergen, general superintendent of the Sacramento Valley Power Company, it is reported, has been in Chico making investigations to determine if sufficient business could be secured to warrant the extension of a transmission line to Chico. The company generates 16,000 hp on Snow and Cow creeks, and its line would be brought to Chico by the way of Anderson and Red Bluff.

ELMHURST, CAL.—The Board of Trade, it is said, will recommend the installation of a new street lighting system in Elmhurst.

LOS ANGELES, CAL.—The Bureau of Los Angeles Aqueduct Power to operate under the direction of the Board of Public Works has been formed to take charge of the development of the Owens River water power in connection wth the aqueduct. E. F. Sattergood, who has been employed by the aqueduct department in connection with the development of the water power to generate electricity for use in connection with the construction of the reservoir, has been retained by the bureau, and will have the title of chief electrical engineer. According to the present plans it will cost about $4,500,000 to develop the power and transmit it to Los Angeles.

MARYSVILLE, CAL.—The chairman of the hospital committee of the Board of County Supervisors has been authorized to advertise for bids for the installation of an electric pumping plant for the county infirmary, plans and specifications for which are now being prepared by Robert Hunter and the chairman of the committee.

MARYSVILLE, CAL.—R. E. Cranston, a well-known civil and mining engineer, is said to be interested in a power plant and gold-dredging enterprise projected on the Yuba River, a few miles above Marysville. The plant will have an ultimate output of 75,000 hp. It is proposed to run a ditch for 20 miles north of Marysville for the dual purpose of supplying a sufficient fall and also to provide water for irrigation to lands adjacent. The Yuba River will be diverted from its course and the bed will be mined for gold by the dredger process. Mr. Cranston expects to start actual work on his project early next spring.

MILL VALLEY, CAL.—A company has been formed by local capitalists to construct an electric railway from Locust Avenue Station to the Muir Woods and thence to the Lagoon. The officers of the company are: John Dias, president; James V. Chase, secretary, who with Judge Conlon and D. C. Braid are directors.

MONTEREY, CAL.—Extensive improvements are contemplated by the Monterey County Gas & Electric Company, which include the installation of a new electric distributing system in Pacific Grove, a new transmission system to Salinas, and the purchase of five new cars.

NEVADA CITY, CAL.—Pending the construction of its new large power plant, it is reported that the Yuba Power & Hydro-Electric Company would purchase electricity from the Alaska mine for transmission into the Alleghany mining district and surrounding camps.

OAKLAND, CAL.—At a meeting of the Board of Supervisors, held recently, the Fruitvale lighting district board was organized. Arrangements have been made for the erection of 136 lamps in the district. The cost of maintenance of the lamps for the ensuing year is estimated at $9,000. Plans have also been completed by the Pioneer lighting board, which is to have 30 lamps, and the cost of maintaining the same is estimated at $2,000. Fourteen lamps are to be installed in the Homestead lighting dstrict, the cost of which is estimated at $1,000 for the ensuing year.

SALINAS, CAL.—W. H. P. Hill, manager of the Monterey County Gas & Electric Company, states that the company has just installed a modern steam turbine plant at Monterey with an output of 3000 hp, that only about 800 hp is required to serve Pacific Grove, Monterey and the street car line, and that Salinas will be connected with the Monterey works sooner or later. It is said that the Salinas plant will be overhauled and placed in first-class condition and will be held in reserve in case of emergency. One of the reasons given for this move is that the company could obtain its fuel cheaper in Monterey than in Salinas and also that on account of the large quantity of water used by the works it would be more economical to erect a transmission line to Salinas than to make the required alterations in the local plant.

SANTA ROSA, CAL.—The Sonoma & Lake County Railroad Company, it is said, has secured the right-of-way through Alexander Valley and on to Preston for its proposed electric railway, which is to extend from Santa Rosa to Lakeport. J. E. Fulton, of Lakeport, is manager.

SAN FRANCISCO, CAL.—The Sunset Telephone & Telegraph Company has filed a notice with the county clerk that the indebtedness of the company has been increased from $3,000,000 to $15,00,000 for the purpose of securing funds for improvements and extensions to its property.

SAN FRANCISCO, CAL.—The directors of the Mojave Water & Power Company, capitalized at $20,000,000, have voted to increase the bonded indebtedness of the company by $15,000,000. Among those interested in the company are Julian Mathieu, Harry C. Mack, Francis C. Van Deinse, Charles F. Metteer, Chauncy S. Goodrich and A. E. Boynton. The company is said to have vast holdings in the southern part of the State and is in a position to furnish water to the counties of Fresno and Kern. Attorney A. E. Boynton, one of those interested, states that the company increased its bonded indebtedness at this time, not to sell bonds, but for the purpose of being in readiness to do so in after years.

STOCKTON, CAL.—A contract has been entered into between the trustees of Reclamation District No. 348 and the Pacific Gas & Electric Company, San Francisco, by the terms of which the corporation will furnish power to the district to operate pumping plants for a period of ten years, the contract price being $30,000. There will be installed on the 15,000-acre tract three 100-hp centrifugal pumps and two 350-kw transformers. The introduction of electricity to operate pumping plants in the delta region is an innovation, and it is stated that other tracts will follow suit.

TROPICO, CAL.—A public highway lighting district has been formed in Tropico to provide illumination, the expense to be borne by the district.

YREKA, CAL.—The Siskiyou Power & Electric Light Company, which is erecting a transmission line from its plant at Fall Creek to Dunsmuir, expects to have its line completed within two months, when it will be ready to supply electricity for lamps and motors to all points between Hornbrook and Dunsmuir.

YUBA CITY, CAL.—It is proposed to form a distributers' organization to secure electrical service from the new transmission line now being erected from Yuba City to Meridian, by the Pacific Gas & Electric Company.

CENTRAL CITY, COL.—The Maumee Gold Mining Company, which owns a group of claims near the War Dance, is reported to be considering the installation of a large power plant to furnish electricity for the mines.

GOLDEN, COL.—The American Smelter & Mines Company has purchased the smelter at Golden owned by the Clear Creek Mining & Reduction Company. It is said that the purchasing company proposes to make improvements to the plant which will involve an expenditure of about $25,000. Plans are being made to introduce electricity for motive power, which will be furnished by the Central Colorado Power Company.

TELLURIDE, COLO.—Owing to a washout at Trout Lake, the storage reservoir of the Telluride Power Company, Sept. 6, practically every mine in the San Miguel district was obliged to close down. The property of the company was damaged to the extent of many thousands of dollars. The flume feeding from the lake to the lower plant was destroyed. The Illium power plant was entirely washed away and part of the Butterfly mill. The Ames power plant, located in Telluride, was not materially injured, but is helpless for lack of water. The Ouray plant is supplying electricity for lamps. The Smuggler Union mine, which generates its own power, is the only mine in operation in this vicinity.

CANAAN, CONN.—At a recent meeting of the Canaan fire district it was voted to renew the contract for street lighting with the Berkshire Power Company for a term of five years at a rate of $15 per lamp per year.

ROCKVILLE, CONN.—Arrangements are being made by the New England Company to replace the old wooden water wheel in its plant with a new turbine wheel, which, when installed, will drive an electric generator to provide electricity to operate the mill.

WILMINGTON, DEL.—The Wilmington & Chester Traction Company is planning to install a 1500-kw, alternating-current generator and turbine.

WILMINGTON, DEL.—The Trustees of the Poor have appointed a committee, consisting of A. V. L. George, Dr. John Ball and T. A. D.

Houston, to look into the matter of establishing an electric light plant on the county's Farnhurst property. The annual cost of lighting the almshouse is more than $1,200 per year.

WASHINGTON, D. C.—Bids will be received until Sept. 21 at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., to furnish at the navy yards and naval stations the following supplies: Brooklyn, N. Y., Schedule 1654—Motor-driven tool room lathe; motor-driven tool room shaper; motor-driven radial drill; motor-driven universal milling machine; motor-driven sensitive drill; motor-driven, two-wheel emery grinder or column; motor-driven portable cylinder boring machine, etc. Schedule 1655—30,000 ft. incandescent lamp cord. Schedule 1663—1000 lb. aluminum; 10,000 lb. ingot copper, etc. Norfolk, Va., Schedule 1657—5000 ft. lighting wire. Schedule 1667—11,160 lb. hard-drawn seamless brass tubing. Boston, Mass., Schedule 1667—Ammeters, voltmeters and wattmeters. Applications for proposals should designate the schedules desired by number.

SARASOTA, FLA.—The city is reported to have granted a franchise for the construction of an electric light plant.

DALTON, GA.—Plans are being considered by the City Council for improvements and extensions to the municipal electric light plant, including the installation of an engine and generator, the cost of which is estimated at $10,000.

HAGERMAN, IDAHO.—It is reported that plans are being considered by H. A. Stroud for the installation of an electric power plant with an output of 75,000 hp and the construction of an electric railway.

SHELLEY, IDAHO.—The Gem State Power Company has commenced work on its power site, located about two miles north of Shelley. It is said that bids are being asked for the construction of the dam and headgate on the Snake River, the cost of which is estimated at approximately $25,000. N. N. Holm is engineer.

WEISER, IDAHO.—At a meeting of the residents of Malheur county, a committee, consisting of R. A. Atwood, Stuart French and J. W. Stoneman, was appointed to investigate the question of installing an electric pumping plant to take water from the Snake River for irrigation, and also to take up the matter of securing electricity to operate the same from the Idaho-Oregon Light & Power Company, of Boise, Idaho.

ABINGDON, ILL.—The local electric plant, owned by the Abingdon Electric Company, is reported to have been purchased by a new company organized by local business men.

CHICAGO, ILL.—Bids will be received by I. J. Bryan, clerk of the Sanitary District of Chicago, Ill., until Sept. 22 for furnishing the following material, for which proposals may be made on any or all of the divisions, as follows: Division A, high pressure pumping unit; division B, induction motors. Delivery and installation must be made in accordance with the detailed specifications and completed within six months after the award of the contracts. Proposals will also be received at same time and place for furnishing copper and aluminum conductors and high-tension insulators. All proposals must be made upon blank forms furnished by the Sanitary District and in accordance with plans and specifications and contract form on file in the office of the electrical engineer of the Sanitary District, Room 1500, American Trust Building, Chicago, Ill., and which can be obtained upon application therefor. Robert R. McCormick is president of Board of Trustees.

EAST MOLINE, ILL.—The plant of the United Light & Power Company was destroyed by fire Sept. 1, causing a loss of about $10,000. The plant has not been in use since Aug. 1, when the company was consolidated with the People's Power Company, of Moline, and electricity for operating the East Moline system furnished from the power station at Moline.

MOLINE, ILL.—The Moline Plow Company, of Moline, is changing its plant from steam power to electric drive. The switchboards, panel boards, switches, etc., were furnished by the Trio Manufacturing Company of Rock Island, Ill., and the motors and circuit breakers by the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa. The Electric Construction & Machinery Company, of Rock Island, has the contract for the installation of the entire equipment.

MONMOUTH, ILL.—Plans are being made by the Rock Island Southern Railroad Company for the construction of a power house at Edwards River. Contracts for the equipment have been awarded to the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa. The equipment will include two turbine units complete with generators rated at 15,000 kw.

OBLONG, ILL.—The capital stock of the Oil Belt Traction Company has been increased from $100,000 to $500,000. The company is constructing a railway from Charleston to Mt. Carmel, passing through Casey, Bellaire, Oblong, Hardinville and Bridgeport. N. L. Upson is manager.

FORT WAYNE, IND.—The Fort Wayne-Bryan Electric Railway Company has petitioned the County Commissioners for a franchise to construct an electric railway from the State line to Reed's Corner. The company proposes to build an interurban railway from Fort Wayne to Bryan, a distance of about 48 miles. Edgar A. Tennis, of Fort Wayne, Ind., is interested in the project.

PLYMOUTH, IND.—The commissioners of Marshall and St. Joseph counties have granted franchises to the Citizens' Mutual Telephone Company, of Marshall and St. Joseph counties to erect telephone lines through the respective counties.

VINCENNES, IND.—Surveys are being made by the Vincennes, West Baden & Louisville Traction Company, under the direction of Jerome Johnson, for its proposed electric railway between Jasper, Petersburg and Vincennes, 48 miles in length. Subsidies to the amount of $50,000 have been voted for the company and a permit has been granted by Congress to construct a bridge across the White River one mile north of Petersburg.

CENTERVILLE, IA.—The Centerville Light & Traction Company is reported to have awarded contracts for the construction of a seven-mile extension from Centerville to Mystic, as follows: For overhead material, to the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., and the Ohio Brass Company, of Mansfield, Ohio; for wire, to the American Steel & Wire Company, of Chicago, Ill., and the Wasco Supply Company, of St. Louis, Mo. Kaye & Carter, of Minneapolis, Minn., and Lee, Lord & Company, of Peoria, Ill., will furnish poles and ties.

DAVENPORT, IA.—The Town Council of Bentendorf is considering the question of installing water works and lighting system.

SIGOURNEY, IA.—The plant and holdings of the Sigourney Electric Light & Power Company have been purchased by J. F. Bray. It is said that the new owner will enlarge and double the output of the plant.

STERLING, KAN.—The City Council has entered into a contract with the Morris Electrical Company to furnish electricity for lighting the town for a period of five years. The company is to furnish 30 lamps of 60 cp, 58 lamps of 32 cp and sufficient number of incandescent lamps to light the city hall, water works and other public property, for $135 per month on an all-night, moonlight schedule.

WICHITA, KAN.—The plants and holdings of the Edison Electric Light & Power Company and the United Gas Company are reported to have been purchased by the Electric Bond & Share Company, of New York, N. Y., the consideration being $2,000,000. F. G. Sykes, of New York, N. Y., it is said, will be president of the new company.

LOUISVILLE, KY.—Plans have been completed by D. X. Murphy & Brother, of Louisville, for the proposed factory building to be erected by Udolpho Snead at a cost of about $200,000. They provide for a building eight stories high to cover an area of 185 ft. x 90 ft. and will be used for manufacturing purposes, the tenants to be supplied with light, heat and power. Bids for construction of the building will soon be opened.

PORTLAND, MAINE.—It is reported that the Portland Electric Light & Power Company will develop the water power of the Saco River at Bonney Eagle, and has contracted to supply 4000 hp for operation of the mills at Sanford.

ROCKLAND, MAINE.—The City Council has entered into a contract with the Rockland, Thomaston & Camden Railway Company for lighting the streets of the city for a term of five years, under which the company agrees to furnish 62 4-amp magnetite arc lamps, at $85 each per year, and 12 tungsten incandescent lamps of 60 cp on an all-night, moonlight schedule, at $28 per lamp per year. The company also agrees to substitute three 60-cp tungsten lamps for one arc lamp, and three 40-cp incandescent lamps for two series 60-cp tungsten lamps, if desired by the city; also to furnish ten 40-cp incandescent lamps between Lindsey and Park streets on Main Street, on the moonlight schedule, without charge.

SANFORD, MAINE.—The Sanford Light & Power Company is making extensive improvements to its plant, which, when completed, will double the output of the plant. The new equipment includes a 350-hp engine, direct-connected to a 250-kw generator and new switchboard. Two new boilers, rated at 125 hp each, will also be installed. The cost of the work is estimated at about $10,000.

CONWAY, MASS.—The Conway Electric Street Railway Company is reconstructing the dam on South River near Conway Junction. The dam will furnish power to generate electricity, which will be utilized for operating the street railway system and for lighting. It will be 125-ft. high and will provide a storage capacity of 120,000,000 gal.

ERVING, MASS.—At a special meeting held recently it was voted to accept the act of the legislature establishing an electric light district in precinct No. 1 and to establish a lighting system. The commission was authorized to purchase electricity to supply to street lamps at a cost not to exceed $300. Noah Rankin, Henry D. Reynolds, William T. Richards and Charles F. Clark are members of the commission.

FITCHBURG, MASS.—The State Gas and Electric Light Commission has authorized the Fitchburg Gas & Electric Light Company to issue 3623 additional shares of capital stock at $85 per share, the par value being $50 per share. The money received from 3000 shares to be used to pay off promissory notes and $10,000 of coupon notes, and the proceeds of the remainder to be used to pay for improvements made to the plant previous to June.

LYNNFIELD, MASS.—An agreement has been reached between the New England Telephone & Telegraph Company and the officials of the Reading municipal electric light plant, providing for joint ownership in the line of poles that extends from Reading to Lynnfield Center, by the way of Pine, Main, Sumner and Chestnut streets. Electricity for lighting the village of Lynnfield will be furnished from the municipal electric plant at Reading. The transmission line will be strung on the same poles as the telephone lines.

DETROIT, MICH.—The Detroit, Lansing & Grand Rapids Railway Company has filed a mortgage in favor of the Union Trust Company, of Detroit, Mich., as trustee, to secure an issue of $5,000,000 in bonds. The company proposes to construct an electric railway from Detroit to Grand Rapids, via Lansing, a distance of 135 miles.

KALAMAZOO, MICH.—The Michigan & Chicago Westbound Railway Company has filed for record at Kalamazoo a $3,000-000 mortgage in favor of the Chicago Title & Trust Company. The company proposes to construct an electric railway between Kalamazoo and Grand Rapids. Alfred H. Brown is said to be interested in the project.

ST. LOUIS, MICH.—Preparations are being made by the Union Telephone Company for improvements to its system, which will involve an expenditure of about $20,000.

FAIRFAX, MINN.—The proposition to issue bonds for the construction of an electric light plant will be submitted to the people in the near future.

FERGUS FALLS, MINN.—The City Council is considering the question of extending the street lighting system on Lincoln Avenue and Hill Street, the cost of which is estimated at $1,500.

GRAND RAPIDS, MINN.—The proposition to replace the present street arc lighting system with tungsten incandescent lamps is under consideration.

JANESVILLE, MINN.—Plans are being made by the Cannon Valley Telephone Company for extensive improvements to its system in Janesville, Minn.

MINNEAPOLIS, MINN.—Dr. P. M. Hall, health commissioner, it is stated, will apply to the Board of Tax Levy for an appropriation of from $50,000 to $75,000 to install an electric light plant at the crematory, to furnish electricity for lighting the entire and northeast portions of the city. The cost of the equipment is estimated as follows: Engine and dynamo, $16,000; distributing system, $60,000, and 600 lamps at $25 each, $15,000.

ROCHESTER, MINN.—The Council has voted to make improvements and extensions to the municipal electric light plant, which will include the installation of a 500-kw generator, steam engine and switchboard.

JACKSON, MISS.—Arrangements are being made by the Cumberland Telephone & Telegraph Company to erect a new long-distance telephone line from Jackson to New Orleans along the right-of-way of the New Orleans Great Northern Railroad.

MERIDIAN, MISS.—The Meridian Light & Power Company is making extensive improvements and extensions to its system, which will involve an expenditure of from $45,000 to $60,000. Contracts have already been let and work is under way. J. N. Eley, of Atlanta, Ga., is engineer in charge of the work.

CENTRAL CITY, NEB.—Bids will be received by C. E. Newmeyer, city clerk, until Sept. 27 for the construction of power house for electric light plant.

FAIRFIELD, NEB.—We are informed that bids will be opened Sept. 21 for the construction of an electric light plant and water works system. H. E. Underkofler is city clerk.

LINCOLN, NEB.—It is stated that the Omaha, Lincoln & Beatrice Railway Company will resume work on its electric railway, which is to connect Lincoln, Bethany Heights, University Place, Omaha, Papillion, Springfield and Waverly, 56 miles in length. The railway has been completed between Lincoln University and Bethany Heights, a distance of five miles. E. C. Hurd is secretary.

PLATTSMOUTH, NEB.—The Railway Commission has granted the Plattsmouth Telephone Company permission to issue additional capital stock to the amount of $45,000, the proceeds of which will be used to take up outstanding obligations and for improvements to its plant at Weeping Water, Louisville and other places.

FALLON, NEV.—It is reported that the Nevada Wonder Company is contemplating the construction of an electric power plant in Fallon to supply electricity in Fallon.

MANHATTAN, NEV.—Arrangements are being made by the Manhattan War Eagle Mining & Milling Company for the installation of an electric pump at the 240-ft level on the Stray Dog Station.

LITTLETON, N. H.—The commissioners of the municipal electric light plant have contracted for a 280-hp Rollins engine to be installed in the upper electric light station to be used as an auxiliary for the power plant. It is understood that the installation of the new engine is the beginning of a movement to establish a day service in Littleton.

IRVINGTON, N. J.—The Reading Electric Company, of Reading, Pa., has submitted a proposition to the Irvington Town Council offering to install a high-tension electric lighting plant with sufficient output to supply seven arc lamps of 2000-cp and not more than 800 incandescent lamps of 32 cp for $55,000. The estimate submitted includes the erection of the power house, the installation of equipment, including engine, boiler, and other apparatus and the erection of distributing system and placing of street lamps ready for operation. A bid has also been submitted by the Public Service Corporation for a renewal of its present contract for street lighting, which expires Jan. 1., for terms of one, three and five years as follaws: For one year contract, not less than 570 incandescent lamps of 32 cp, $17 per lamp per year; not less than five arc lamps of 2000 cp, $100 each per year; three-year contract, not less than 570 incandescents, first year, $15 each, second year $16 per lamp, third year $17 per lamp; arc lamps $95 each per year; five-year contract, not less than 570 incandescent lamps, first and second year $15 per lamp per year, third and fourth year $16, fifth year $17 each; arc lamps $90 each per year. The estimates for one year stipulate that carbon filament incandescent lamps will be used. On three and five-year contracts the company agrees te furnish tungsten lamps. At present the town is using 581 incandescent lamps and three arc lamps at a flat rate of $15 each per year, and arc lamps at $100 per lamp per annum. In the offer made the company stipulates that after January 1, 1910, no free lamps would be allowed the town. Under the present contract about 40 lamps are furnished free of charge in the municipal building.

JERSEY CITY, N. J.—The Hudson & Manhattan Railroad Company has been granted permission by the Jersey City street and water board to extend its Cortlandt Street tunnel system under Railroad Avenue to Summit Avenue.

SOUTH AMBOY, N. J.—The City Council has granted the Jersey Central Traction Company, of Keyport, N. J., a franchise to construct its proposed extension through South Amboy to Perth Amboy.

ALAMOGORDO, N. M.—Arrangements are being made by the High Mills Rolls Company for the construction of a large power plant, which is to furnish electricity for a new electric railway and for several pumping stations in the valley.

ALBUQUERQUE, N. M.—A stock company has been formed by residents of the eastern portion of Albuquerque for the purpose of constructing an electric street car line in that portion of the city, for which a franchise has already been applied for. The proposed line will give that part of the city two street car systems.

ALBUQUERQUE, N. M.—The Blue Water Development Company, which is operating about 100 miles west of Albuquerque, on the main line of the Santa Fe Railroad, expects to have its dam completed by the middle of the winter. The dam will impound water enough to irrigate 21,000 acres and operate the power plant furnishing electricity for Central New Mexico.

CLINTON, N. Y.—Bids will be received by the Board of Trustees until Sept. 21, for furnishing electricity sufficient to supply 27 street arc lamps of 2000 cp, on an all-night schedule, and not to exceed 10 incandescent lamps of 32 cp, as per specifications, which can be seen at the office of Louis M. Martin, Village President. The bids are to be based upon the supplying by said bidder of the incandescent service to private consumers at 8 cents per kw-hour, as per specifications on file at the office of the Village President. W. H. Brockway is Clerk of Board of Trustees.

CLOVIS, N. M.—E. J. Howard, J. D. Hammett and A. R. Hammett, of Moberly, Mo., have been granted a franchise by the City Council to construct and operate an electric railway in Clovis.

DEKALB, N. Y.—The Public Service Commission, Second District, has granted the Rensselaer Falls Electric Light & Power Company permission to construct and operate a distribution system in the town of DeKalb, and in the village of DeKalb Junction, for the purpose of furnishing electricity for lamps, heat and motors.

FRANKLINVILLE, N. Y.—New equipment is being installed in the plant of the Empire Electric Company, including an engine, boiler and generator, which will increase the output of the plant by 500 hp, making the total output 1000 hp. The company furnishes electricity for operating the cutlery plant of the Ontario Knife Company, and will now supply energy to the Empire Flour and Planing Mills, the G. R. Warren sawmill and other local industries, as well as for street lighting and residential lighting. Arrangements are being made to establish a day service, and in another year the present street lamps will be replaced with tungsten lamps.

FULTON, N. Y.—Arrangements are being made by the Fulton Light, Heat & Power Company to secure electrical energy from the Syracuse, Lake Shore & Northern Railroad Company to help out during the low-water period. The company has recently installed a 250-hp motor, which will be connected with the transmission system of the railroad company.

HUDSON, N. Y.—The Public Service Commission, Second District, has approved the plan and agreement for the reorganization of the Albany & Hudson Railroad Company submitted by the reorganiztion committee, representing a large number of stockholders and bondholders of the company. The plans provide for the issuance of $3,275,000 in stock to be exchanged for the present outstanding stocks and bonds. The new company also asks for authority to issue a mortgage of $1,500,000, the greater portion of which is to be used in double-tracking the third-rail system between Rensselaer and Kinderhook; the purchase of the bridge connecting Albany and Rensselaer; the improvement of the power houses and completion of the railway to Pittsfield. Myron T. Herrick, of Ohio; Clinton L. Rossiter, vice-president of the Long Island Loan & Trust Company, and R. A. C. Smith, president of the American Mail Steamship Company, are members of the committee. The property was sold at auction, Sept. 8, to I. W. Day, of New York, secretary of the reorganization committee, for $550,000.

JAMESTOWN, N, Y.—The American Metal Door Company is in the market for a new or slightly used 125-hp, vertical, two or three-cylinder gas engine, available for use on or before Oct. 1.

MOHAWK, N. Y.—The committee appointed to investigate the question of installing an electric light plant in Mohawk states that a plant can be established in the town and maintained at a saving of from $2,000 to $3,000 a year. The citizens have instructed the committee to have plans prepared, after which the village will ask for bids. Frank DuBois, Jay Brackett, D. C. Ford and Ralph Devendorf are members of the committee.

NEW YORK, N. Y.—The Bronx Gas & Electric Company has petitioned the Public Service Commission for permission to issue $1,500,000 in bonds, the proceeds to be used to retire outstanding obligations.

NEW YORK, N. Y.—Bids will be received by the Board of Park Commissioners at the office of the Department of Parks, Arsenal Building, Fifth Avenue and Sixty-fourth Street, Borough of Manhattan, New York, N. Y., until Sept. 30 for furnishing and installing electric lighting fixtures in the new addition of the Metropolitan Museum of Art. Plans may be seen and blank forms may be obtained at the above office. Henry Smith is president of Board of Commissioners.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, N. Y., until Sept. 20 for installing electric equipment in vocational school at Public School 100, located on One Hundred and Thirty-eighth and One Hundred and Thirty-ninth streets, Borough of Manhattan. Blank forms, plans and specifications may be obtained at the office of the superintendent, estimating room, ninth floor, Fifty-ninth Street and Park Avenue.

NORWICH, N. Y.—Plans have been approved by the Norwich Gas & Electric Company for improvements and extensions to its gas and electric plants, including the installation of a 150-kw generator and 200-hp engine. About four miles of gas mains will be laid. F. W. Somers, of Ithaca, is general manager.

PATCHOGUE, N. Y.—The Public Service Commission, Second District, has authorized the Patchogue Electric Light Company to exercise its franchises granted by the Town of Brookhaven to furnish electricity for public and commercial purposes in that town.

RIVERHEAD, N. Y.—The Public Service Commission, Second District, has issued an order requiring the Hallett Light & Power Company and the Riverhead Electric Light Company to improve their transmission lines immediately in the streets of Riverhead.

ROCHESTER, N. Y.—The contract for wiring the Convention Hall addition and for the installation of an electric elevator was awarded by the Board of Control to the Rochester Electric Construction Company, for $6,438.

ROCHESTER, N. Y.—The Rochester Railway & Light Company has awarded contracts to the Allis-Chalmers Company for two water wheels to be placed in stations No. 5 and 15 before the first of the year. The larger of the two wheels, which has a rating of 2400 hp, will be placed in the plant at the lower falls. The 1200-hp wheel will be installed in station No. 15 at the middle falls. A new penstock 150 ft. long and 11 ft. in diameter will also be placed at the No. 5 station. Thomas H. Yawger is superintendent.

INKSTER, N. D.—It is stated that an electric lighting system will be installed at Inkster.

BUCYRUS, OHIO.—The Bucyrus Telephone Company has decided to install an automatic telephone service in this city. The system will be installed by the Automatic Electric Company, of Chicago, Ill., and is to be completed by May 1, 1910.

CANAL DOVER, OHIO.—The contract for the construction of the new electric plant and power house, it is reported, has been awarded to Harry B. Saxe. The cost of the plant is estimated at about $35,000.

CROOKSVILLE, OHIO.—Plans are being considered by the Independent Telephone Company to improve and extend its local plant, which will involve an expenditure of about $3,000. J. B. Rhodes is local manager.

FREMONT, OHIO.—The contract for the construction of the new plant of the Fremont Power & Light Company to be erected on the Sandusky River, in Ballville Village, one mile south of Fremont, has been awarded to Robert R. Lysle, of Chicago, Ill. The proposed plant will cost about $600,000 and will have an output of about 2500 hp. In addition to erection of the large power plant the company is interested in one or two railway projects. The dam will be 27 ft. high and about 260 ft. long; the water from the dam will be carried to the power house through a steel pipe 14 ft. in diameter, 3000 ft. long and will give a fall of 42 ft. In addition to the hydro-electric plant a 1000-hp steam plant will be installed, which will be located in a separate building, to be used in emergencies and during low water periods. Walter Putnam, of Chicago, Ill., is associated with Mr. Lysle in construction of the plant.

MANSFIELD, OHIO.—G. A. Bartholomew, president and general manager of the Sandusky, Norwalk & Mansfield Railway Company, and Sherman Culp, of Norwalk, Ohio, are interested in a project to construct an electric railway from Mansfield to Bucyrus, a distance of about 30 miles. It is said that the Sandusky, Norwalk & Mansfield Company will issue $750,000 in bonds, the proceeds to be used to build the new railway. The company also contemplates building an extension from Mansfield to Shelby, 10 miles in length.

OBERLIN, OHIO.—The City Council has granted the local telephone company a franchise to place its wires and cables underground on certain streets in the city.

WATERVILLE, OHIO.—A company has been organized in Waterville for the purpose of furnishing electricity for lamps and motors. As yet no plans have been prepared or machinery purchased. Delmar J. Farnsworth, G. D. Dedrich, C. J. Stickney, H. F. Van Fleet, G. G. Schwin and J. H. Bennett, all of Waterville, are interested in the enterprise.

ARDMORE, OKLA.—It is reported that J. T. Dickerson will make application to the City Council for a franchise to install an electric light system in Ardmore.

BLACKWELL, OKLA.—Bids will be received at the office of the city clerk, Blackwell, Okla., until Sept. 20, for furnishing material and constructing an electric lighting system and extending water works and sewerage systems and for construction of city hall as follows: 1—For furnishing material and labor (except cast-iron pipe, hydrants and valves, electrical machinery, pumping machinery, steam engine) and constructing electric light and water works systems. 2—For furnishing cast-iron pipe and special castings. 3—For furnishing hydrants and valves. 4—For furnishing one 700-gal. per minute vertical volute pump and motor. 5—For furnishing generators, switchboard and transformers. 6—For furnishing one high-speed engine, 75-kw unit. 7—For furnishing one Corliss engine, rated at 150 kw. 8—For furnishing all material and installing one filter in two units of 500,000 gal. each daily capacity. 9—For furnishing all materials and erecting settling basins and filter house. 10—Bidders may also submit bids on filtration system of their own design, subject to engineer's approval. 11—For furnishing and building sewer extensions. 12—For furnishing and building a city hall. All material is to be delivered f. o. b. cars Blackwell, Okla. All of the above material and work to be furnished and done in accordance with the plans and specifications on file at the office of A. Sparks, city clerk, Blackwell, Okla., and at the office of Burns & McDonnell, engineers, 821 Scarritt Building, Kansas City, Mo. Any one desiring extra copies of the plans and specifications may obtain the same by making payment of five dollars to cover the cost of the prints.

CLINTON, OKLA.—The citizens are reported to have voted to issue $40,000 in bonds, the proceeds to be used for purchasing an electric light plant.

ERICK, OKLA.—The citizens, it is reported, have voted to issue $10,000 in bonds, the proceeds to be used to establish an electric light plant.

LONE WOLF, OKLA.—Bonds to the amount of $45,000 have been sold by the city, the proceeds to be used for an electric light plant and water works.

TULSA, OKLA.—The Oklahoma Union Traction Company has commenced work on the construction of its electric railway from Tulsa to Orcutt's Lake, a distance of three miles. The railway will eventually be extended to Sapulpa.

WESTVILLE, OKLA.—The Westville Electric Light & Power Company, recently organized, contemplates the construction of an electric light plant to cost about $8,000. W. T. Tipton is acting secretary.

BAKER CITY, ORE.—The City Council has granted a franchise to the Eagle River Power Company to erect transmission lines for the distribution of electricity in this city.

DAYTON, ORE.—The Yamhill Electric Company has been granted a franchise by the City Council to construct and operate an electric light plant in Dayton.

EUGENE, ORE.—The City Council has awarded the contract for the construction of the transmission line of the city's new power plant on the McKenzie River to J. B. Morris, of Eugene, for $3,642. The transmission line will be about 15 miles in length.

OSWEGO, ORE.—The Oregon Iron & Steel Company, it is reported, is interested in a project to erect a power plant of sufficient output to supply electricity for lamps and motors for public, private and industrial purposes.

PORTLAND, ORE.—The Portland Railway, Light & Power Company contemplates building a branch railway, starting at Milwaukee and extending through Clackamas county, which will be used primarily for transporting officers and men of the Oregon National Guard to the rifle range recently purchased by the State near Clackamas.

SALEM, ORE.—The Portland Railway, Light & Power Company, of Portland, Ore., has been granted a franchise by the Marion County court for the erection of a high-tension transmission line from Mt. Angel to Woodburn. The cost of the line is estimated at about $7,000 and when completed will materially improve the electrical service in Salem as well as in Woodbury, Mt. Angel and other towns in this vicinity. Rollin K. Page is local manager.

HARRISBURG, PA.—The City Council on August 30 rejected the second time the bids submitted by the local electric lighting companies for furnishing electricity for lighting the subways, city department buildings, offices and the Mulberry Street Bridge. Bids were first rejected because the companies submitted bids for furnishing electricity alone, placing the cost of the new lamps and repairs on the city. The second bids were made in such a manner that the cost of the service could not be estimated, and it was decided to readvertise and require bids to be submitted in such form that the cost could be reckoned. The Harrisburg Light, Heat & Power Company offered to furnish electricity on all but the bridge for seven cents per kw-hour, and on the bridge for five and one-half cents per kw-hour. The bid of the Paxtang Company was six and one-half cents per kw-hour on all the buildings but the filter plant, as it has no wires to the Island, and six cents per kw-hour for lighting the bridge.

HOLLIDAYSBURG, PA.—Application has been made to the town officials by the Juniata Electric Light, Heat & Power Company for a franchise to establish an electric light plant in Hollidaysburg.

KUTZTOWN, PA.—It is understood that a petition will be presented to the Town Council asking that a 24-hour service be furnished by the municipal electric light plant.

McCALL FERRY, PA.—A contract has been awarded by J. Edward Aldred, receiver of the McCall Ferry Company, to the Empire Engineering Company, of New York, N. Y., for the construction of the dam and

hydro-electric power station. It is reported that a new company is being formed to purchase the entire property of the McCall Ferry Company at a receiver's sale. The company proposes to transmit electricity to Baltimore and other cities. William Barclay Parsons is president of the Empire Construction Company.

PITTSBURGH, PA.—Sealed proposals will be recived at the office of the controller of Allegheny County, Pittsburgh, Pa., until Sept. 21, for the installation and completion of the electric lighting fixtures for the Allegheny County Soldiers' Memorial. Plans and specifications can be seen at the office of the county engineer. Information and blank forms can be secured at the same office. R. J. Cunningham is county controller.

PITTSBURGH, PA.—The Duquesne & Dravosburg Street Railway Company has decided to increase its capital stock from $18,000 to $180,000 and commence work on the construction of its proposed railway at once. The railway will be about three miles in length.

READING, PA.—The Metropolitan Electric Company is reported to have awarded a contract to George S. Charles, of Wilmington, Del., for the installation of 16 Edge Moor boilers rated at 625 hp each in its new power plant at Reading. The cost of the power plant is estimated at $2,000,000.

PEACE DALE, R. I.—Preparations are being made by the Peace Dale Manufacturing Company, of Peace Dale, to equip a portion of its mill for electric drive. Orders have been placed by the company with the Westinghouse Electric & Manufacturing Company, through Lockwood, Green & Company, of Boston, Mass., for a 750-kw, low-pressure, steam turbine, which will be driven by the exhaust steam of the main engine. A generator will be connected with the turbine, which will furnish electricity to operate a large part of the worsted mill, while the dyehouse, wool-scouring mill, combing and drawing departments will be driven by motors placed in the different departments.

ANDERSON, S. C.—The Anderson Water, Light & Power Company contemplates extensive improvements to its power plant located at Portman Shoals, which will increase the output of the plant by 700 hp. The cost of the work is estimated at $20,000. H. A. Orr is president and manager.

HURON, S. D.—Arrangements are being made by the Dakota Central Telephone Company for the erection of a new exchange building. F. H. Ellerbe, of St. Paul, Minn., is architect.

LEXINGTON, TENN.—Plans are being considered for organizing a company to install an electric light plant in Lexington. H. E. Graper, C. G. Gathings, N. R. Barham and others are interested.

FLORENCE, TEX.—The Bartlett-Florence Railway Company has let the contract for the construction of a railway between Bartlett and Florence, 20 miles in length. In the beginning this road will be operated by steam, but later it will be converted into an electric traction line. G. W. Hubbard is president of the company and W. J. McDaniel, first vice-president and general manager.

FORT WORTH, TEX.—A. M. Hyatt, of Kansas City, Mo., is promoting the building of an interurban electric railway between Fort Worth and Cleburne, by way of Dallas. The proposed road will be about 70 miles long. The preliminary surveys were recently completed under the direction of B. G. Leake, chief engineer.

FORT WORTH, TEX.—The Fort Worth, Mineral Wells & Western Railroad Company has been organized with principal offices at Fort Worth, for the purpose of building a railroad between Fort Worth, Texas, and Roswell, N. M., a distance of about 375 miles. Paul Hurley and L. C. Cole, of Fort Worth, are among the incorporators. It is planned by the company to first build the railway between Fort Worth and Mineral Wells, a distance of 60 miles, and to operate that division as an interurban electric line. A number of wealthy Arkansas men are associated with Messrs. Hurley and Cole in the present project.

AMARILLO, TEX.—Preparations are being made for the construction of a telephone line between Amarillo and Wildorado, 21 miles in length. With the completion of the proposed line into Wildorado, it is expected that an extension will be made to Tucumcari, N. M. C. C. Tabor, of Amarillo, and associates are interested in the enterprise.

SAN ANTONIO, TEX.—The contract for the power plant for the Southwestern Insane Asylum at San Antonio has been awarded to the Allis-Chalmers Company, of Milwaukee, Wis., by Charles B. White, state purchasing agent. The plant is to be installed at once and the equipment will include boilers, engines and electrical machinery.

UVALDE, TEX.—The Uvalde Street Railway Company is preparing to build an extension of its railway from Uvalde to Batesville, a distance of 20 miles. This company now operates a four-mile line at Uvalde. Gasoline motor cars are used instead of electric traction. The route of the proposed extension is down the valley of the Leona River, through a section that is being settled rapidly by farmers.

SALT LAKE CITY, UTAH.—Plans have been completed by the Salt Lake & Ogden Railway Company for the construction of a new power plant, to be located at Farmington, which will supply electricity to operate the trains between Salt Lake City and Ogden. The power plant now under construction at Lagoon is expected to be ready for operation by Nov. 1. H. A. Strauss is consulting engineer.

MONTPELIER, VT.—The Corry-Deavitt Frost Company has placed a contract with D. W. Cooley, of Waterbury, Vt., for the construction of another dam about 2000 ft. from the present plant at Kinney's Mills, in East Montpelier. The dam will be 150 ft. long x 12½ ft. high, and will cost about $30,000. With a fall of 30 ft. it will develop about 1000 hp, which will nearly double the output of the present plant. The company now furnishes electrical energy for operating the cars of the Barre & Montpelier Traction & Power Company between Barre and Montpelier. When the dam is completed the company will erect a transmission line to the Barre quarries, having closed a contract to furnish electricity for a term of five years for the Wetmore & Morse quarries at Graniteville.

BUENA VISTA, VA.—The Buena Vista Light & Power Company is making improvements to its plant, including the installation of new machinery for the purpose of extending its service.

FREDERICKSBURG, VA.—Preparations are being made by the Fredericksburg Power Company for the construction of a new power house in this city. The new dam has been completed and is in use, the old dam having been abandoned. It is expected that the electric railway will be extended from Ashland to this city and Washington as soon as the power plant is completed.

LURAY, VA.—The Shenandoah River Light & Power Company has awarded the contract for constructing a large concrete dam to replace the present wooden structure across the Shenandoah River, one mile below Luray, to Lane Bros.

COSMOPOLIS, WASH.—Application has been made by the Grays Harbor Railway & Light Company for a franchise to furnish electricity in Cosmopolis.

INDEX, WASH.—Work has commenced on the construction of the proposed power plant to be erected by J. A. Soderburg, owner of the Index granite works, at Sunset Falls, two miles south of Index. The plant will furnish electricity for the granite works, and also for lamps and motors in Index and neighboring towns.

SPOKANE, WASH.—The Spokane, Walla Walla & Western Railway Company is reported to have completed surveys for its proposed power plant. It is stated that the company has secured a site where 4500 hp can be developed which will be sufficient to operate its proposed railway. L. C. Goodwin is engineer.

MADISON, WIS.—Plans are being considered for the construction of a new interurban railway along the Wisconsin River to be known as the Chicago & Wisconsin Valley Railway, to connect Madison and Wausau, via Portage, Lodi, Stevens Point and Grand Rapids. Work will soon commence on the survey of the route. Madison capitalists are interested in the project.

MENOMONEE FALLS, WIS.—The Milwaukee Electric Railway & Light Company has applied to the Board of Trustees for a franchise to extend its electric railway through Menomonee Falls. The company proposes to build an extension from Milwaukee to Beaver Falls.

MILWAUKEE, WIS.—In an estimate submitted to the Council joint committee on street lights and health by S. A. Greeley, Milwaukee representative of Hering & Fuller, of New York, N. Y., consulting engineers for the city, the cost to build an annex to the garbage crematory at the foot of Erie street to utilize the steam power created by the incineration of the city refuse to generate electricity is estimated at $60,000, exclusive of the distributing system. It is stated that the new incineraor will provide sufficient power to generate 500 kw of electricity daily. It has not been decided whether to utilize the energy for street lighting and commercial purposes or to transmit it across the river to operate the sewage pumping station. The estimated cost of the equipment is as follows: For three generators, $26,250; boilers, $15,250; building, $8,500, and coal handling and storage apparatus about $2,000. If the plant is used for street lighting exclusively, storage batteries would have to be used.

PESHTIGO, WIS.—It is reported that work will soon begin on the construction of the power house at High Falls for the Hydro-Electric Company, the contract for which has been awarded to the Bates & Rogers Construction Company, of Chicago, Ill. The penstock will be erected by the Lyons Boiler Company, of De Pere, Wis.

WASHBURN, WIS.—The city is reported to have awarded a contract to the Ashland Power Company, of Ashland, Wis., to furnish electricity in Washburn. A transmission line will be erected from the power plant on the White River to Ashland.

KINGSTON, ONT., CAN.—Robert A. Ross, of Ross & Holgate, consulting engineers, of Montreal, has been appointed by the city to inquire into the cost of power supplied by the Kingston Street Railway Company to the city.

LONDON, ONT., CAN.—The Board of Aldermen has instructed E. I. Sefton, electrical engineer, to prepare plans for an underground system for the transmission lines of the Hydro-Electric Commission power system and to procure estimates of the cost of the same. The cost of the underground system is estimated at approximately $70,000.

PORT ARTHUR, ONT., CAN.—The City Council is considering the formation of a company to work in conjunction with the municipal street railway system and build electric lines through the townships of Oliver and Shuniah. For further information address J. J. Carrick.

PRINCE ALBERT, SASK, CAN.—C. E. Mitchell, C. E., Toronto, Ont., retained by the City Council to report on the available water power to the north of Prince Albert, estimates there is 10,000 hp in close vicinity to the city and easy of development. It is probable the City Council will at once make arrangements to utilize this power to generate electricity.

RENFREW, ONT., CAN.—John B. McRae, consulting engineer, has been engaged by town officials to report on the advisability of installing a municipal hydro-electric power plant.

WATERLOO, ONT., CAN.—The Board of Trade is discussing the establishment of an independent telephone system.

WINNIPEG, MAN., CAN.—The tender of the Westinghouse Company for 50 arc lamps with cut-offs, for $1,637, has been recommended to the City Council for acceptance.

WINNIPEG, MAN., CAN.—The City Council has voted to accept the recommendation of the Board of Consulting Engineers for awarding the contracts for equipment of the power pant at Point du Bois, as follows: Sections 5 and 6, turbines, to Jens, Orten, Baving & Company, of London, Eng., for $97,150, including erection; sections 7 and 8, generators and exciters, to Vickers, Sons & Maxim, Ltd., Sheffield, Eng., for $93,080, including erection; sections 10, 11, 23, transformers, switching and protective apparatus, to the Canadian Westinghouse Company, of Hamilton, Ont., for $150,800, including spare parts; section 12, light, heat and power system generating station, to the General Electric Company, of Toronto, Ont., Can., for $11,600; section 25, traveling cranes, to the Canadian Fairbanks Company, Winnipeg, Man. (Niles-Bement-Pond Company), for $14,900, including erection; auxiliary apparatus to the Canada Foundry Company, of Toronto, Can., for $27,520, and the Canadian Fairbanks Company, of Winnipeg, Man., for $6,901. Prof. L. A. Herdt, William Kennedy, Jr., and Col. H. N. Ruttan are members of the board of consulting engineers.

GUADALAJARA, MEX.—The Chapala Hydro-Electric & Irrigation Company has made arrangements wtih the Caja de Prestamos, of Mexico City, for a loan of $2,200,000. The proceeds will be used as needed in connection with the construction of the new power plant at Puente Grande, on the Santiago River, the erection of transmission line to the Etzatlan and Hostotipaquillo mining districts, and for pumping plants and irrigation canals. The company recently entered into a contract with the Department of Fomento for a loan of $3,000,000, the proceeds of which will be used for building the proposed dike across a portion of Lake Chapala from La Palma to Jamay. Work has already commenced on the erection of the iron towers which will carry the transmission lines to the mining districts of Etzatlan and Hostotipaquillo. It is stated that electricity will be furnished in the former district by the first of the year and the last named by March, 1910. Electrical energy will be furnished from the company's plant near Las Juntas, near this city, pending the completion of the Puente Grande power plant. The new company has formally taken possession of the street railways, light and power systems in Guadalajara. At a recent meeting held in Mexico City the local company was consolidated with the Chapala Hydro-Electric & Irrigation Company.

MONTEREY, MEX.—Plans are being prepared by the Mines of Mexico Company, of Denver, Colo., for extensive improvements for its mines in the Alamos district, which include the erection of a large hydro-electric plant on the Mayo River for furnishing its mines in the State of Sonora with electricity for both mining and milling purposes. The company some time ago obtained a concession from the Mexican Government for water rights on the Mayo River. Surveys have just been completed of 135 miles of the river and three different sites have been located suitable for building dams. The company owns mines in western Chihuahua and it is expected that electricity will be transmitted to its mines in that section.

New Industrial Companies.

THE AUTOMATIC ELECTRIC IGNITER COMPANY, of New York, N. Y., has been incorporated with a capital stock of $40,000 to manufacture gas and electric fixtures, by Nicolo Candelora, Eugene De Feo and Vincenzo Blasio, all of New York, N. Y.

THE BRANDER SUPPLY COMPANY, of Pelham Manor, N. Y., has been incorporated with a capital stock of $5,000 by Thomas W. Brander, John A. Brander and Charles H. Talbott, Jr., all of New York, N. Y., for the purpose of dealing in railway supplies.

THE COOPER-SNELL COMPANY, of Little Falls, has been chartered with a capital stock of $5,000 by Roswell Cooper, of Little Falls, N. Y.; Lewis J. Snell, of Dolgeville, N. Y., and Frank H. Shall, of Little Falls, N. Y. The company proposes to do a general engineering, construction and contracting business.

THE DIAMOND ELECTRIC COMPANY, of Binghamton, N. Y., has been chartered with a capital stock of $100,000, by S. J. Hirschmann, J. Schwab and H. C. Price, all of Binghamton, N. Y. The company proposes to manufacture electric devices and appliances.

THE ELECTRIC TRACTION CONSTRUCTION COMPANY, of Kansas City, Mo., has been incorporated with a capital stock of $100,000, by John J. Freunlich, Frank Avery, N. C. Vannatte and others. The company proposes to do traction construction work.

THE INDIANA AUTO PARTS COMPANY, of Marion, Ind., has incorporated with a capital stock of $75,000, to build and operate a plant to manufacture automobile parts, supplies and electric equipment. G. R. Stewart, Richard Rudell and J. D. Kennedy are incorporators.

THE JOHNSON-BONE SWITCH THROW COMPANY, of Decatur, Ill., has been chartered with a capital stock of $40,000 for the purpose of manufacturing railway appliances. The incorporators are: A. R. Scott, Max H. Hurd and J. L. Bones.

THE MEXICO STEEL & CHEMICAL COMPANY, of Mexico City, Mex., has been organized with a capital stock of $1,000,000. It is said that the company proposes to manufacture a high-grade steel by an electrical process, and also to make calcium carbide. F. S. Pearson, vice-president of the Mexico Light & Power Company, Mexico City, is interested in the enterprise. R. C. Brown will have charge of the new company.

Company Elections.

BRIDGETON, N. J.—At the annual meeting of the Bridgeton & Millville Traction Company and the Bridgeton Electric Company, held Sept. 2, J. J. Sullivan, of Philadelphia, Pa., was re-elected president of both companies, H. J. Crowley vice-president, and C. L. S. Tingley secretary and treasurer, both of Philadelphia, Pa.

JAMESTOWN, N. Y.—At the annual meeting of the Jamestown Lighting & Power Company the following named officers were elected: Harry F. Sheldon, president; John T. Wilson, vice-president, and Albert S. Price, secretary and treasurer.

New Incorporations.

LOS ANGELES, CAL.—The Long Beach Electrical Manufacturing Company has been incorporated with a capital stock of $20,000 by T. J. Corbrey, W. H. Tidmarsh, S. F. Estell, J and C. Gleason.

SAN FRANCISCO, CAL.—The Sierra Pacific Electric Company, capitalized at $5,000, has been incorporated by C. P. Eells, Hugh Goodfellow and J. Eells.

DENVER, COL.—Articles of incorporation have been filed with the Secretary of State for the Inland Empire Irrigation & Power Company. The company is capitalized at $1,000,000 and proposes to furnish water and power in the states of Colorado, California, Utah, Nevada and Arizona. Elmer Bisbee, W. H. Dixon and Charles N. Miller are directors.

DECKER, IND.—The White River Valley Telephone Company has been chartered by James F. Breithaupt, Daniel Lane and Richard Ready. The company is capitalized at $10,000 and proposes to operate a telephone system in Decker.

PERU, IND.—The Peru Gas & Light Company has been incorporated with a capital stock of $60,000 to establish, equip and operate plants to furnish light, heat and power to the City of Peru and adjacent towns and villages by means of natural and artificial gas, electricity, steam and hot water. George M. Dolby, Oscar Ridenour and Otto Sample are directors.

CORNETTSVILLE, KY.—The Cornettsville Telephone Company has been organized with a capital stock of $1,000 to construct an independent telephone system in Cornettsville. It will also construct telephone lines to Hyden, a distance of 39 miles, and from Cornettsville to Tillie and Gourd, 25 miles in length. William Cornett is manager of the company.

HAZELDEAN, ONT., CAN.—The Hazeldean Rural Telephone Company has been incorporated with a capital stock of $30,000 and the following named directors: W. T. Shirriff, J. J. Hodgins, R. H. Grant, R. H. Steacy, H. G. Allen, T. A. Bradley, A. Bradley and W. W. Mann.

Legal.

APPLICATION FOR RECEIVER FOR THE DESCHUTES IRRIGATION & POWER COMPANY.—Application has been made for the Deschutes Irrigation & Power Company, of Bend, Ore., in a suit filed in the United States court in Portland, Ore., by John G. Deshler, of Columbus, Ohio. Conspiracy, mismanagement and breach of trust is charged against the directors of the company, which is alleged to be in arrears for the last three interest payments on a bonded indebtedness of $359,000. With the exception of $20,000 the entire bond issue is owned by capitalists, of Columbus, Ohio. The company has a contract to reclaim about 250,000 acres in Eastern Oregon of which about one-fourth has been placed under irrigation up to the present time.

Personal.

MR. JOHN B. McRAE has been engaged as consulting engineer by the town of Renfrew, Ont., to report on the advisability of installing a municipal hydro-electric plant.

MR. JULIUS BERNSTEIN, formerly with the Leeds & Northrup Company, has joined the department of electrical measuring instruments of Queen & Co., Philadelphia.

MR. C. E. MITCHELL, C. E., of Toronto, Canada, has made a report to the city of Prince Albert, Saskatchewan, on the water-power available in the neighborhood. He found that 10,000 hp can be easily developed.

MR. LOUIS COHEN has resigned from the staff of the Bureau of Standards, Washington, D. C., to accept a position with the National Electric Signalling Company as mathematician and experimental engineer.

MR. JAMES WOLFF, sales agent for the New York Insulated Wire Company in Chicago, has been appointed Chicago manager for the American Circular Loom Company, of Boston. Mr. Wolff will manage both agencies.

PROF. L. A. HERDT, of McGill University, and Mr. W. A. Lamb, of the Canadian General Electric Company, have been appointed a board to examine candidates for the position of electrical inspector of the Canadian Inland Revenue Department.

MR. R. F. HAYWARD, formerly general manager of the Mexican Light & Power Company, with headquarters at Montreal, Canada, has been appointed general manager of the Western Power Company, with headquarters at Slave Lake, B. C.

MR. SAMUEL INSULL, president of the Commonwealth Edison Company, of Chicago, sailed for England on the steamship *Cedric* on Sept. 4. He accompanied his father, mother and sister on their return to London after a visit to this country. It is expected that Mr. Insull will be back in his office in Chicago about Oct. 1.

MR. J. C. HENDERSON, who has been for the past two and one-half years Indianapolis representative for the Westinghouse Electric & Manufacturing Company, will sever his connection with that office on Sept. 15 to accept a position as Eastern sales manager for the Waverley Company, Indianapolis, Ind. Mr. Henderson expects to make his headquarters in New York City.

MESSRS. SMITH, KERRY & CHACE, engineers, whose main office is in Toronto, have just opened a branch office at Vancouver, B. C., for carrying on British Columbia and Pacific Coast work, with Mr. H. J. Haffner (McGill, 1904), in charge. Mr. Haffner is experienced in railway, municipal and irrigation engineering. It is proposed to do general business, including in particular hydro-electric development.

MR. RODMAN GILDER, secretary of the Crocker-Wheeler Company, was one of the wounded during the recent "war" in Eastern Massachusetts, receiving a severe kick from his horse while on active duty. He is now at the country home of his father, Richard Watson Gilder, at Tyringham in the Berkshires, studying the more gentle arts of peace and convalescence. While no bones were broken, the doctors have insisted on a period of quiet and rest.

PROF. GEORGE C. SHAAD, who for the past three years has been connected with the electrical engineering department of the Massachusetts Institute of Technology, has resigned his position as associate professor there to become head of the department of electrical enginering at the University of Kansas. Prof. Shaad is a graduate of the Pennsylvania State College. For several years he was a member of the electrical engineering department of the University of Wisconsin.

MR. JOHN F. TINSLEY, for the past three years assistant to the manager of the American Steel & Wire Company's plants at Worcester, Mass., and New Haven, Conn., has been promoted to be superintendent of the electrical cable works of that company. Mr. Tinsley is a graduate of the electrical engineering department of Rutgers, 1900, and has previously been connected with the Western Electric Company and the electrical engineering staff of the Signal Corps, United States Army.

MR. EDWARD D. ADAMS has received from the Emperor of Germany the decoration of the Prussian Crown order. Mr. Adams is well-known in electrical circles from his reorganization of the Allis-Chalmers Company, and the leading part he has taken in the electrical development of Niagara power, having been one of the founders of the Niagara Power Company. In financial circles he has been a prominent figure for the past 25 years, particularly in connection with the reorganization of railroads, the last including the West Shore in 1886, the Central Railroad of New Jersey in 1887 and the Northern Pacific in 1896. Mr. Adams is one of the chief patrons of the Metropolitan Museum of Art, to which he has made valuable donations.

MR. W. M. ARNOT, who for the past five years has been connected with the Siemens Brothers Dynamo Works in London, having charge of their foreign department, has been appointed manager of the whole Siemens interests in Australia, and recently sailed to Sydney, where their office is situated. Mr. Arnot, previous to coming to London, represented for many years the interests of the Allgemeine Elektricitats-Gesellschaft in Australia, and was for two years connected with the same company at their Johannesburg office. He is therefore returning to the country where he has spent the better portion of his life, and is well acquainted with the whole of the electrical field in Australia, Sydney having been his home for many years in the past.

Trade Publications.

TRANSFORMERS.—Stationary transformers, rated at from 0.5 to 50-kw, are outlined in a folder of the Vindex Electric Company, Aurora, Ill.

WEATHERPROOF SIDING.—The H. W. Johns-Manville Company, 100 William Street, New York, has issued a mailing folder dealing with asbestoside, a material which has been designed to take the place of clapboards, shingles and metal sidings on factories and buildings of this nature.

STEAM TURBINES.—The British Thomson-Houston Company, Rugby, Eng., is distributing neatly printed bulletins devoted to exhaust and mixed pressure turbines of the Curtis type. It is stated that turbines of this type have been built for a total rating of more than one million kilowatts without a single instance of buckets being stripped.

FEED WATER HEATERS.—The three-colored catalog of the Harrison Safety Boiler Works, 3159 North Seventeenth Street, Philadelphia, Pa., serves to present in a striking manner the advantageous features of the Cochrane steam stack and cut-out valve heater and receiver, and describes its application in connection with commercial systems of exhaust steam heating.

TRUMP TURBINES.—The Trump Manufacturing Company, Springfield, Ohio, has issued a catalogue describing its line of high and low-head water turbines, in which a number of important improvements have recently been introduced. A number of installations are interesting and much information given of interest to engineers and owners of water powers.

RECORDING THERMOMETERS.—Bulletin No. 111 of the Bristol Company, Waterbury, Conn., has for subject Bristol's Class II. recording thermometers as especially adapted for feed-water temperature and similar applications. Of particular interest are three record charts giving records of actual feed-water temperatures on pages 5, 6 and 7, and showing very strikingly that far greater uniformity of operation was secured after the Bristol feed-water recording thermometer was installed.

Business Notes.

THE PHILADELPHIA STORAGE BATTERY COMPANY has removed its offices to its new factory, Ontario and C streets, Philadelphia, Pa.

THE GARWOOD ELECTRIC COMPANY reports taking a number of orders recently, among others, for a slow-speed engine type 150-kw generator, 17 motors of various sizes for ventilating work, and a 25-kw engine-type generator for export.

ROTH BROS. & COMPANY.—By the recent renumbering of the greater part of the streets of Chicago the address of the office and factory of Roth Bros. & Company has been changed from 461 to 1400 West Adams Street, Chicago. At this location the firm has a modern motor shop, light, clean and airy, fitted with electric drive, where it manufactures its electrical machinery.

THE CENTURY ELECTRIC COMPANY has opened a New York office, Room 315, Hudson Terminal, 30 Church Street, New York, in charge of Mr. H. B. Steele, district sales manager, in order that it may be in a better position to care for the rapidly increasing demand for Century single-phase, self-starting motors. The line embraces sizes from ¼ hp to 30 hp for any commercial voltage and any frequency between 25 and 140 cycles. Mr. Steele is a graduate of Pratt Institute, and is well known to the New York trade, having been for several years connected with the New York office of the Robbins & Myers Company.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 7, 1909.

[Conducted by W. F. Bissing, Patent Law, 2 Rector Street, N. Y. City.]

13,019. CONTROL SYSTEM FOR ELECTRICAL HOISTS; J. H. Hall and J. F. Schnabel, New York, N. Y. App. filed May 3, 1909. For securing a smooth and even lowering of the load, the speed of lowering being under the control of the operator by means of a magnetic brake. (Reissue.)

933,084. TROLLEY; J. Ledwinka, Philadelphia, Pa. App. filed Nov. 11, 1905. Trackless trolley with improved flexible connection between the vehicle and the trolley utilizing two trolley wires and cross arm, with wheels arranged tandem on each wire.

933,094. ART OF TREATING GASES ELECTRICALLY; I. Moscicki, Gambach, Switzerland. App. filed Aug. 6, 1907. For electrolytically producing oxides of nitrogen by a furnace having an electrodo extending across the furnace chamber and perforated for the exit of the treated gases.

933,133. PROCESS OF TREATING ZINC ORES; F. T. Snyder, Oak Park, Ill. App. filed June 23, 1905. For treating zinc lead ores by smelting with carbon and then heating in a closed electric furnace from which air and gases are excluded.

933,137. ELECTRIC FLASHER; D. D. Swem, Chicago, Ill. App. filed June 27, 1908. A knife switch is operated by a blade and lever by means of a camshaft driven by a motor, and means are provided for varying the rates of speed.

933,144. PORTABLE DRILL DRIVER; T. S. Watson, Milwaukee, Wis. App. filed Sept. 1, 1906. The tool chuck is aligned with the motor shaft and a thrust bearing receives the resistance of the chuck and drill.

933,157. ELECTRIC CONTROLLER; T. V. Buckwalter, Altoona, Pa. App. filed Jan. 20, 1909. An electric controller has a reciprocating part of insulating material with which carbons engage and a rack and spring are connected to the reciprocating and fixed parts to operate the controller.

933,169. ELECTRIC TRANSFORMER FURNACE; O. Frick, Saltsjobaden, Sweden. App. filed March 20, 1908. Leakage fields around the primary coil as well as around the secondary formed by the melting bath are suppressed by placing around the field core a short-circuited conductor having two coils placed at a distance from each other and wound in opposite directions.

933,195. ELECTROLIER; J. McGavin, Springfield, Ill. App. filed Sept. 9, 1908. An adjustable light which when pulled down may be used as a drop light and when raised may form one of the groups of the lights of the electrolier.

933,197. SIGNAL SYSTEM; J. G. Nolen, Chicago, Ill. App. filed May 4, 1903. For a fire or burglar alarm system in which a main circuit runs from the central office to the area to be supervised; a supervisory shunt is arranged in said area and signalling make and break devices are provided in each of the main and shunt circuits, together with means controlled by the conditions of the shunt for actuating the make and break devices.

933,208. TROLLEY POLE; S. Speer, Pittsburgh, Pa. App. filed March 29, 1909. A trolley pole is made in sections, the upper section telescoping into the lower section, and a parallelogram is used in conjunction wtih the pole to support and guide the wheel.

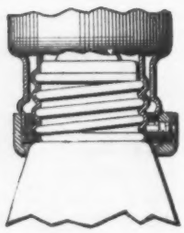
933,211. SYSTEM OF DISTRIBUTION; H. L. Van Valkenburg, Norwood, Ohio. App. filed June 22, 1905. Makes use of a plurality of mains, a translating device, leads therefor, a transfer switch for connecting the leads to any set of the mains and an electro-magnetically operated oil switch for completing the circuit of the translating device with an interlock between the switches.

933,218. DANGER ZONE SIGNAL FOR TURRETS; F. W. Wood, Newport News, Va. App. filed June 8, 1908. For use with the gun turrets of battle ships in which a signal automatically notifies the gunners in any turret when their guns are turned so as to endanger any other turret.

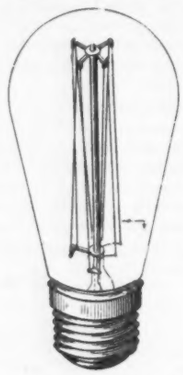
933,220. DYNAMO-ELECTRIC MACHINE; A. H. Wouters, Norwood, Ohio. App. filed Nov. 3, 1906. Turbo-generator in which all parts of the armature projecting beyond the core are held against centrifugal action by means of a ring having a shoulder.

933,226. DYNAMO MACHINE CONSTRUCTION; B. A. Behrend, Norwood, Ohio. App. filed May 17, 1906. For high-speed turbo-generators, cooled by air in which the oil for the bearings is prevented from being drawn into the rotor by the air current by a special construction of oil guard.

933,246. IGNITION DEVICE FOR GAS ENGINES; A. F. Gifford, J. J. Burns and B. S. T. Bishop, Worcester, Mass. App. filed Nov. 6, 1908. Combines a bracket with the dash of the vehicle and a spark receptacle connected to the bracket, the parts being arranged to be accessible by moving them bodily rearwardly from the dash.



933,296.—Locking Device for Incandescent Electric Lamp Bulbs.



933,539. — Incandescent Electric Lamp.

933,263. OSCILLATION DEVICE; G. W. Pickard, Amesbury, Mass. App. filed March 25, 1909. A rectifying oscillation detector mounted in a holder consisting of a metallic cup. The detector consists of iron pyrite and a leaf spring is arranged to present its broad side to the surface of the pyrite.

933,267. DYNAMO-ELECTRIC MACHINE; W. I. Richards, Norwood, Ohio. App. filed Jan. 31, 1907. A field magnet having a pole piece with a pair of concentric shunt coils adjacent to the armature end of the pole and a superposed series coil with T-shaped spacing members, channel shaped in cross section.

933,296. LOCKING DEVICE FOR INCANDESCENT ELECTRIC LAMP BULBS; Levi Davis, Alton, Ill. App. filed March 15, 1909. For preventing the theft of lamp bulbs by locking them to their sockets by means of a ring.

933,369. ELECTRIC ALARM SIGNAL; H. J. Hover, Chicago, Ill. App. filed July 18, 1908. An alarm bell sounded at a railroad crossing. The improvement is in the bell mechanism.

933,412. ELECTRIC CALL AND ALARM SYSTEM; O. O. Barker, Allegheny, Pa. App. filed March 23, 1907. For telephone switchboards for hotels to sound an alarm in any room at a predetermined time. Controlled by a clock.

933,450. ELECTRIC IGNITER FOR GAS STOVES; R. Hofmeister, St. Louis, Mo. App. filed Feb. 9, 1909. The igniter comprises a pair of electrodes with contacts which are connected to a source of electrical energy and normally separated from the contacts, and means for moving the electrodes into engagement with the contacts that are connected to the source of electrical energy.

933,456. PROCESS FOR WELDING AND BONDING RAILS AND OTHER METAL PIECES; C. F. Jacobs, Chicago, Ill. App. filed June 28, 1907. Process of uniting metal rails by heating them by a flux passing a current through them and the flux, the resistance of the flux generating the heat.

933,457. PROCESS FOR UNITING RAILS AND OTHER METAL PIECES; C. F. Jacobs, Chicago, Ill. App. filed Oct. 11, 1907. Process of uniting rails by supporting a splice bar at a distance from the base of the rails, applying a molten flux and metal between the splice bar and the rails, then passing an electric current therethrough to heat the parts.

933,458. PROCESS FOR BONDING RAILS; C. F. Jacobs, Chicago, Ill. App. filed May 28, 1908. For electrically uniting rails by means of bonds by holding a quantity of flux in contact with the rails, heating the pieces by means of a flux and an electric current, introducing a bond into the flux, passing an electric current therethrough so as to heat the same, and then forcing the parts together.

933,459. PROCESS FOR UNITING METAL PIECES; C. F. Jacobs, Chicago, Ill. App. filed May 28, 1908. For electrically uniting rails by placing two parts together, putting molten flux between the spaced apart portions, passing an electric current through and forcing the pieces into intimate contact.

933,480. ELECTRIC SWITCH; Henry E. Reeve, New York, N. Y. App. filed May 12, 1908. An electric switch for lamps having a spring contact arm with a tongue, a spring catch with a portion engaging said tongue to support the arm and a cam for operating the parts.

933,409. HEAD GEAR FOR SUPPORTING LIGHTS; D. E. Taylor, Willimantic, Conn. App. filed Oct. 30, 1908. For holding a headlight when used by surgeons by means of a spring metal band extending over the head from front to back with means for adjusting the position of the light.

933,505. TROLLEY BASE; F. Volk, Pittsburg, Pa. App. filed Nov. 3, 1908. An anti-frictionless spring connection for trolley poles employing roller bearings which engage a movable spring housing.

933,506. ELEVATOR; B. M. Walpole, Providence, R. I. App. filed Feb. 2, 1909. A duplex system of motors for operating electric elevators which motors rotate in opposite directions and are connected through a system of differential gearing to a driving drum to which the rope is connected.

933,525. PRIMARY BATTERY; W. M. Brodie, East Orange, N. J. App. filed April 7, 1909. For primary batteries in which two elements are used in an exciting fluid, to avoid injury by shock as when jarred on automobiles. The cell comprises a sheet metal body section and a resilient metal support welded to the bottom.

933,529. INCANDESCENT ELECTRIC LAMP; Herman J. Jaeger, New York, N. Y. App. filed Aug. 24, 1908. For lamps containing a long metallic filament which may be burned horizontally in which flat elastic supports are provided so that the free ends of loops may be cemented thereto.

933,557. ELECTRICAL SIGNALING APPARATUS; Owen L. Harrison, Coleta, Ill. App. filed April 2, 1908. For operating harmonic call bells by means of a rotary pole chamber supplying current of different frequencies to a number of lines.

933,577. TEMPERATURE CONTROLLING DEVICE; W. B. D. Pennimaker, Baltimore, Md. App. filed Nov. 20, 1905. Makes use of a main conduit, conveying the refrigerating medium, such as brine, with a second conduit leading into it and carrying a medium of higher temperature; a third conduit also leading into it and carrying a medium of lower temperature with valves controlling the second and third conduits and a motor controlled by a thermostat for operating the valves.

933,507. APPARATUS FOR TESTING RAIL BONDS; C. R. Sturdevant, Worcester, Mass. App. filed March 31, 1909. To test the conductivity of a railbond by means of a differentially wound measuring instrument combined with a bar having a contact point adapted to engage the flat rail, another bar with contact point and a measuring tape for giving the distance between the two contacts.

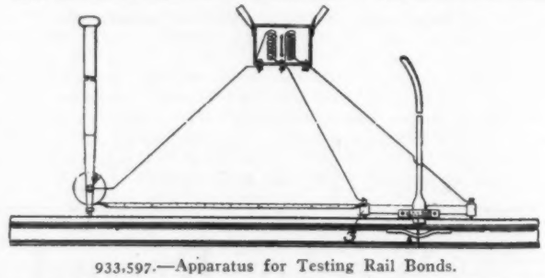
933,622. ELECTRICAL COOKING APPARATUS; T. M. Caven, Kansas City, Mo. App. filed Sept. 24, 1907. For toasting or broiling, in which the heating units are removably held by means of spring clips.

933,644. WEATHERPROOF SOCKET FOR ELECTRIC LAMPS; Gilbert W. Goodridge, Bridgeport, Conn. App. filed June 1, 1908. Includes an insulating body with lamp holding terminals, terminal plates having binding screws, and enclosing a supporting cap for the back, electrical connections and an insulating compound, filling the space in the back of the lamp socket.

933,661. WALL CABINET FOR ELECTRICAL APPARATUS; H. T. Paiste, Philadelphia, Pa. App. filed March 24, 1908. For containing switches and the like, the cabinet being made up of end units and intermediate units, each unit consisting of a fixed and a removable section confining a bushing between them, the removable section having a keyhole slot and the stationary section having a screw entering the slot.

933,662. TRAIN DISPATCHER'S SIGNALING AND CONTROLLING SYSTEM; G. E. Patrick, Salem, Vo. App. filed May 22, 1908. The dispatcher has entire control of the road by means of a board that includes a miniature railroad and tell-tale trains thereon, equipped with propelling devices automatically operated by the train or trains on a main road.

933,697. ELECTROLYTIC CONDENSER COMBINED WITH AUTO-TRANSFORMER; E. E. F. Creighton, Schenectady, N. Y. App. filed July 13, 1907. An aluminum electrolytic condenser with which a transformer winding is used. A plurality of aluminum condenser cells are connected, each in shunt with a portion of the winding.



933,597.—Apparatus for Testing Rail Bonds.

933,710. MOTOR ATTACHMENT FOR SEWING MACHINES AND THE LIKE; C. E. Johnson, Los Angeles, Cal. App. filed April 10, 1909. The circuit for the electric motor is operated by the treadle and the speed of the machine will be varied by varying the pressure on the treadle.

933,716. SWITCHBOARD; R. C. Livingston, Spring Valley, Minn. App. filed Nov. 20, 1908. For telephone systems in which two parties on a line may converse without being interfered with by other parties. Uses a switching mechanism which ordinarily does not interfere with the transmission of signals, but when calling the switch transmits the call without passing through central.

933,717. PROCESS OF TREATING ORES; A. A. Lockwood and M. R. A. Samuel, London, Eng. App. filed Jan. 11, 1909. For treating ores by mixing it with particles of a magnetic material becoming liquid so that the magnetic substance adheres to some constituent part of the ore in preference to the others, thus permitting magnetic separation of the mixture.

933,722. COMPOSITION MATTER AND METHOD OF MAKING THE SAME; William A. Phillips, St. Louis, Mo. App. filed Feb. 20, 1906. For electric conductors in rheostats, consisting of a combination of asbestos and iron fused together.

933,723. COMPOSITION OF MATTER AND THE METHOD OF MAKING THE SAME; William A. Phillips, St. Louis, Mo. App. filed Feb. 18, 1907. For electric conductors for rheostats, comprising a composition of a metallic electric conductor and carbonate of lime fused together.

933,726. TELEGRAPH KEY; F. W. Smith and DeWitt C. Conkling, New York, N. Y. App. filed June 6, 1908. Makes use of separate keys for sending dots and dashes and varies the periodicity of the interruptions of the circuit.